AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

S. HRG. 115–482

PENDING LEGISLATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
PUBLIC LANDS, FORESTS, AND MINING

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

ON

S. 32	**S. 468**	**S. 941**
S. 90	**S. 614**	**S. 1149**
S. 357	**S. 785**	**S. 1230**
S. 436	**S. 837**	**S. 1271**
S. 467	**S. 884**	**S. 1548**

JULY 26, 2017

Printed for the use of the
Committee on Energy and Natural Resources

PENDING LEGISLATION

S. HRG. 115–482

PENDING LEGISLATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
PUBLIC LANDS, FORESTS, AND MINING

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

ON

S. 32	**S. 468**	**S. 941**
S. 90	**S. 614**	**S. 1149**
S. 357	**S. 785**	**S. 1230**
S. 436	**S. 837**	**S. 1271**
S. 467	**S. 884**	**S. 1548**

JULY 26, 2017

Printed for the use of the
Committee on Energy and Natural Resources

Available via the World Wide Web: http://www.govinfo.gov

U.S. GOVERNMENT PUBLISHING OFFICE

26–870 WASHINGTON : 2020

COMMITTEE ON ENERGY AND NATURAL RESOURCES

LISA MURKOWSKI, Alaska, *Chairman*

JOHN BARRASSO, Wyoming
JAMES E. RISCH, Idaho
MIKE LEE, Utah
JEFF FLAKE, Arizona
STEVE DAINES, Montana
CORY GARDNER, Colorado
LAMAR ALEXANDER, Tennessee
JOHN HOEVEN, North Dakota
BILL CASSIDY, Louisiana
ROB PORTMAN, Ohio
LUTHER STRANGE, Alabama

MARIA CANTWELL, Washington
RON WYDEN, Oregon
BERNARD SANDERS, Vermont
DEBBIE STABENOW, Michigan
AL FRANKEN, Minnesota
JOE MANCHIN III, West Virginia
MARTIN HEINRICH, New Mexico
MAZIE K. HIRONO, Hawaii
ANGUS S. KING, JR., Maine
TAMMY DUCKWORTH, Illinois
CATHERINE CORTEZ MASTO, Nevada

SUBCOMMITTEE ON PUBLIC LANDS, FORESTS, AND MINING

MIKE LEE, *Chairman*

JOHN BARRASSO
JAMES E. RISCH
JEFF FLAKE
STEVE DAINES
CORY GARDNER
LAMAR ALEXANDER
JOHN HOEVEN
BILL CASSIDY
LUTHER STRANGE

RON WYDEN
DEBBIE STABENOW
AL FRANKEN
JOE MANCHIN III
MARTIN HEINRICH
MAZIE K. HIRONO
CATHERINE CORTEZ MASTO

COLIN HAYES, *Staff Director*
PATRICK J. MCCORMICK III, *Chief Counsel*
LUCY MURFITT, *Senior Counsel and Public Lands & Natural Resources Policy Director*
ANGELA BECKER-DIPPMANN, *Democratic Staff Director*
SAM E. FOWLER, *Democratic Chief Counsel*
DAVID BROOKS, *Democratic General Counsel*

CONTENTS

OPENING STATEMENTS

	Page
Lee, Hon. Mike, Subcommittee Chairman and a U.S. Senator from Utah	1
Barrasso, Hon. John, a U.S. Senator from Wyoming	4
Daines, Hon. Steve, a U.S. Senator from Montana	5
Murkowski, Hon. Lisa, Chairman and a U.S. Senator from Alaska	7

WITNESSES

Tester, Hon. Jon, a U.S. Senator from Montana	105
Casamassa, Glenn, Associate Deputy Chief, National Forest System, U.S. Forest Service, U.S. Department of Agriculture	111
Hatch, Hon. Orrin G., a U.S. Senator from Utah	124
Ruhs, John, Acting Deputy Director for Operations, Bureau of Land Management, U.S. Department of the Interior	127

ALPHABETICAL LISTING AND APPENDIX MATERIAL SUBMITTED

29 Palms Inn:	
Letter for the Record	252
Advocates for Access to Public Lands:	
Letter for the Record	193
Agenda	2
Alabama Hills Stewardship Group:	
Letter for the Record	194
Alaska Federation of Natives:	
Statement for the Record	12
Alaska Miners Association:	
Letter for the Record	196
Alaska State Legislature, 2006:	
Legislative Resolve No. 37 for the Record	37
Alaska Wilderness League, et al.:	
Letter for the Record	197
Aloysius, Jr., Mrs. Jake A.:	
Letter for the Record	82
American Exploration & Mining Association:	
Email and Letter for the Record	199
American Fly Fishing Trade Association:	
Letter for the Record	201
American Forest Resource Council:	
Letter for the Record	202
American Rivers:	
Letter for the Record	206
Americans for Responsible Recreational Access (ARRA), et al.:	
Letter for the Record	229
Amik, David:	
Email for the Record	208
Anderson, Jr., Nels:	
Letter for the Record	34
Andrews Jr., John B.:	
Letter for the Record	57
Ark Land:	
Letter for the Record	209
Backcountry Hunters & Anglers:	
Letter for the Record	211

Page

Barrasso, Hon. John:
Opening Statement 4
Bran, David A.:
Letter for the Record 49
Brown, Darrell T.:
Letter for the Record 80
Business for Montana's Outdoors:
Letter for the Record 213
California Wilderness Coalition (CalWild):
Letter for the Record 248
Statement for the Record 249
Casamassa, Glenn:
Opening Statement 111
Written Testimony 114
Responses to Questions for the Record 188
CEMEX Construction Materials Pacific, LLC:
Letter for the Record 265
Central Council Tlingit & Haida Indian Tribes of Alaska and Tanana Chiefs Conference:
Resolutions/Letter for the Record 30
City of Highland (CA):
Letter for the Record 255
Resolution 2016–006 for the Record 256
City of Redlands (CA):
Letter for the Record 259
City of St. George (Utah):
Letter for the Record 215
Conservation Lands Foundation:
Letter for the Record 233
Daines, Hon. Steve:
Opening Statement 5
Photo—Chico Hot Springs 6
Dewey, Valerie J.:
Letter for the Record 65
Earthjustice:
Memorandum for the Record 216
East Valley Water District:
Letter for the Record 263
Endangered Habitats League:
Letter for the Record 264
Feinstein, Hon. Dianne:
Statement for the Record 218
California Protection and Recreation Act of 2017—Overview Map 227
List of Letters and Statements in support of S. 32 228
List of Letters and Statements in support of S. 357 253
Santa Ana River Wash Plan Subcomponents Map 268
Frank, Albert:
Letter for the Record 54
Friends of Big Morongo Canyon Preserve:
Letter for the Record 246
Friends of El Mirage:
Letter for the Record 244
Friends of Jawbone:
Letter for the Record 238
Friends of the Inyo:
Letter for the Record addressed to Senators Murkowski and Cantwell dated July 19, 2017 240
Letter for the Record addressed to Senator Feinstein dated April 10, 2017 242
Glover, Everett J.:
Letter for the Record 74
Graves, John W.:
Letter for the Record 77
Gray, James:
Letter for the Record 50

Page

Greater Yellowstone Coalition:
Letter for the Record dated July 24, 2016 269
Copper Sulfide Mining Fact Sheet, Earthworks 270
U.S. Copper Porphyry Mines Report, Earthworks, July 2012 272
Letter for the Record dated July 24, 2016 306
Center for Science in Public Participation: Memorandum regarding Emigrant Prospect, MT, and Lucky Minerals, dated September 9, 2015 307
Montana Bureau of Mines and Geology: Baseline Water-Quality Investigation, Emigrant Creek Watershed, South-Central Montana, 2016 313
Letter for the Record dated July 24, 2016 335
Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements by Kuipers, Maest, MacHardy and Lawson, 2006 336
Letter for the Record dated August 2, 2017 563
U.S. Gold Mines: Spills & Failures Report, Earthworks, July 2017 564
Letter for the Record dated August 2, 2017 628
Selected press clippings regarding proposed gold mines in Park County, MT:
Article by Alex Philp in the Billings Gazette dated August 5, 2017, titled "Guest opinion: Daines holds up Yellowstone Gateway Act" ... 634
Article in the Billings Gazette dated August 1, 2017, titled "Gazette opinion: Time to protect Paradise Valley" 636
Article in the Bozeman Daily Chronicle dated July 30, 2017, titled "Tester's bill too important for platitudes" 639
Article by David McCumber in the Billings Gazette dated July 30, 2017, titled "Mine near Yellowstone gets DEQ approval for preliminary drilling" 640
Article by the Associated Press in the Billings Gazette dated July 26, 2017, titled "Gold mining proposal near Yellowstone advances" 643
Article by Elliott D. Woods in The Guardian dated July 16, 2017, titled "'More valuable than gold': Yellowstone businesses prepare to fight mining" 645
Article by Michael Wright in the Bozeman Daily Chronicle dated June 22, 2017, titled "Paradise Valley mine opponents pressuring Daines to support Tester's ban" 649
Article by Liz Kearney in The Livingston Enterprise dated June 20, 2017, titled "Locals seek action from Steve Daines on fed mining ban" 651
Article by Tyson Nunley in the Billings Gazette dated June 9, 2017, titled "Protect Yellowstone River" 653
Article in the Billings Gazette dated June 3, 2017, titled "Gazette opinion: Permanent protection for Paradise" 654
Article by Sabina Strauss, Richard Parks, and Nathan Varley in the Bozeman Daily Chronicle dated June 3, 2017, titled "Delegation must keep up fight against mine near YNP" 657
Article by Gillian Cleary in the Bozeman Daily Chronicle dated May 18, 2017, titled "Thanks to Sen. Tester for his stance on Yellowstone" 659
Article by John Salazar in the Billings Gazette dated May 6, 2017, titled "Yellowstone more valuable than gold" 660
Article by Justin Post in The Livingston Enterprise dated May 2, 2017, titled "Enterprise Editorial: Ryan Zinke's chance" 661
Article by Rich Hohne in the Bozeman Daily Chronicle dated April 30, 2017, titled "Time for Montanans to stand up for our Yellowstone" 663
Article by Sabina V. Strauss in the Bozeman Daily Chronicle dated April 29, 2017, titled "Thanks to Sen. Tester for protecting Yellowstone" 663
Article in the Bozeman Daily Chronicle dated April 28, 2017, titled "Tester lauded for standing up for YNP" 664
Article by Brett French in the Billings Gazette dated April 25, 2017, titled "Tester announces legislation to ban mining near Paradise Valley, Yellowstone National Park" 666

Page

Greater Yellowstone Coalition—Continued
Selected press clippings regarding proposed gold mines in Park County, MT—Continued
Article by Ryan Smith in the Bozeman Daily Chronicle dated April 8, 2017, titled "Montanans must stand against mines near Yellowstone" 669
Article by Nate Schweber for Parts Unknown dated April 4, 2017, titled "Montana: Yellowstone's Mining Battle" 671
Article by Mike Garcia in the Bozeman Daily Chronicle dated February 19, 2017, titled "Protection of Yellowstone River should be extended" 676
Article by Ben Bulis in the Billings Gazette dated February 18, 2017, titled "Guest opinion: Protect Montana's Paradise Valley water" 677
Article by Michael Wright in the Bozeman Daily Chronicle dated January 19, 2017, titled "Federal officials hold open house on mineral withdrawal in Livingston" 679
Article by Susan Johnson in the Montana Standard dated December 11, 2016, titled "Congress should protect Paradise" 681
Article by Diane Bristol in the Bozeman Daily Chronicle dated December 17, 2016, titled "Why would we ever put Yellowstone at risk?" 682
Article by Bob and Kitzy Parker in the Billings Gazette dated December 17, 2016, titled "Why Paradise deserves protection" 684
Article by Tom Bowler in the Billings Gazette dated December 11, 2016, titled "Mining projects were not a good idea in Paradise Valley" 685
Article by Justin Post in The Livingston Enterprise dated November 23, 2016, titled "Locals to thank for mining decision" 686
Article by Brett French in the Billings Gazette dated December 12, 2016, titled "Gazette opinion: Protecting Montana's Paradise" 687
Article by Michael Wright in the Bozeman Daily Chronicle dated November 21, 2016, titled "Obama Administration blocks new mining claims on 30,000 acres in Paradise Valley" 690
Article by Bill Stoddart in the Bozeman Daily Chronicle dated December 7, 2016, titled "Preserving special places can't be about politics" 694
Article by Sabina V. Strauss in the Bozeman Daily Chronicle dated November 30, 2016, titled "Jewell's mining block should be made permanent" 695
Article by Steven Koehler in the Billings Gazette dated November 9, 2016, titled "Guest opinion: Don't mine on Yellowstone's border" 696
Article by Kristi Vance in the Bozeman Daily Chronicle dated November 9, 2016, titled "Mining near Emigrant all risk and no reward" 698
Article by Brett French in the Billings Gazette dated October 9, 2016, titled "Mining the Mountains of Paradise: Struggles of the New West coalesce next to Yellowstone" 699
Article by Brant Oswald in the Bozeman Daily Chronicle dated August 24, 2016, titled "Paradise Valley is no place for a gold mine" ... 709
Article by Dan Vermillion in the Bozeman Daily Chronicle dated August 17, 2016, titled "Gold mine not worth putting Yellowstone at risk" 711
Article by Andrew Field in the Billings Gazette dated August 6, 2016, titled "Guest opinion: Let's protect Paradise Valley's greatest treasures" 712
Article by Dylan Brown for E&E News dated August 3, 2016, titled "Yellowstone: Local group battles 2 mining projects just outside park" 715
Article in the Billings Gazette dated July 25, 2016, titled "Gazette opinion: Protect Park County's outdoor assets" 720
Article by Liz Kearney in The Livingston Enterprise dated July 1, 2016, titled "Rep. Zinke sides with opponents of mining near park" 723
Article by Dwight Harriman in The Livingston Enterprise dated July 7, 2016, titled "We can't keep doing this" 725

Page

Greater Yellowstone Coalition—Continued
Selected press clippings regarding proposed gold mines in Park County, MT—Continued
Article by Michael Wright in the Bozeman Daily Chronicle dated April 12, 2016, titled "Company asked to resubmit mining application on Yellowstone border" 727
Article by Liz Kearney in The Livingston Enterprise dated March 25, 2016, titled "Business owners form new group opposing mining near Yellowstone" 731
Article by Samantha Hill in The Livingston Enterprise dated March 1, 2016, titled "Park County criticizes Crevice mine project in Jardine, DEQ takes comments" 732
Article by Liz Kearney in The Livingston Enterprise dated November 9, 2015, titled "Comments on Emigrant drilling plan made public" 733
Article by Liz Kearney in The Livingston Enterprise dated August 20, 2015, titled "Emigrant Peak mine exploration: Thousands comment on company's plan before deadline" 735
Letter to the Editor of The Livingston Enterprise by Bill Burris dated August 20, 2015, titled "Exploratory drilling in geothermal resource area is idiotic" 737
Article by Bill Stoddart in The Livingston Enterprise dated August 19, 2015, titled "The Emigrant Creek Mine is a bad deal" 739
Letter to the Editor of The Livingston Enterprise by John Usher dated August 18, 2015, titled "In favor of exploratory drilling" 741
Letter to the Editor of The Livingston Enterprise by Peter D. Fox dated August 14, 2015, titled "Community Foundation opposes Emigrant mine exploration proposal" 742
Article by Liz Kearney in The Livingston Enterprise dated August 11, 2015, titled "Extensive review sought for mine exploration plan" 744
Article by Justin Post in The Livingston Enterprise dated July 23, 2015, titled "Right decision to extend mineral exploration comment" 745
Article by Liz Kearney in The Livingston Enterprise dated July 21, 2015, titled "Comment period extended on drilling proposal" 747
Article by Liz Kearney in The Livingston Enterprise dated July 16, 2015, titled "Thousands comment on Emigrant mine proposal" 749
Letter to the Editor of The Livingston Enterprise by Anthony Eaton dated July 15, 2015, titled "Too many risks from Lucky Minerals' proposed exploratory drilling" 750
Letter to the Editor of The Livingston Enterprise by Susan and Jeff Bridges dated July 14, 2015, titled "Mine exploration would be a disaster for the area" 752
Letter to the Editor of The Livingston Enterprise by Michelle Uberuaga dated July 13, 2015, titled "Stop this project before it even gets started" 753
Letter to the Editor of The Livingston Enterprise by Gary and Lisa Miller dated July 13, 2015, titled "There is hope for those opposing mining operation in Paradise Valley" 755
Letter to the Editor of The Livingston Enterprise by William C. Edwards dated July 13, 2015, titled "Comments on Lucky Minerals' proposed exploratory drilling" 757
Letter to the Editor of The Livingston Enterprise by Shaun Dykes dated July 13, 2015, titled "Jobs and the environment don't have to be mutually exclusive" 758
Article by Liz Kearney in The Livingston Enterprise dated July 10, 2015, titled "Emigrant Peak Mine Exploration: About 140 people attend meeting on company's proposal" 760
Article by Justin Post in The Livingston Enterprise dated July 10, 2015, titled "There's a place for mines, and it's not on Emigrant Peak" 762
Article by Liz Kearney in The Livingston Enterprise dated July 9, 2015, titled "Emigrant mine plan raising questions, concerns" 764

Page

Greater Yellowstone Coalition—Continued
Selected press clippings regarding proposed gold mines in Park County, MT—Continued
Article by Liz Kearney in The Livingston Enterprise dated July 1, 2015, titled "Groups discuss, express concerns on proposed mine exploration" 766
A Profile of Socioeconomic Measures, Park County, MT 768
Map of "Elk Migrations of the Greater Yellowstone Ecosystem" by the Wyoming Migration Iniative dated September 18, 2015 (DRAFT) 813
Guthert, David:
Statement for the Record 100
Hatch, Hon. Orrin G.:
Opening Statement 124
Written Testimony 126
Henry, Ray:
Letter for the Record 75
Hispanic Access Foundation:
Letter for the Record 247
Huff, Patrick:
Letter for the Record 42
Hunter, Jr., Percy:
Letter for the Record 47
Huntington, Wayne:
Letter for the Record 59
Inland Action:
Letter for the Record 267
Jones, Roger M.:
Letter for the Record 55
Joshua Green Corporation:
Letter for the Record 814
Joshua Tree National Park Association:
Letter for the Record 251
Kake Tribal Corporation:
Letter for the Record 101
Koehler, Steven:
Letter for the Record 816
Koonaloak, George H.:
Letter for the Record 64
KS Wild, et al.:
Letter for the Record 818
List of Supporters of Wild Rogue Legislation 822
Report titled "The Economic Value of Rogue River Salmon" commissioned by the Save the Wild Rogue Campaign, dated January 2009 879
Report titled "Regional Economic Impacts of Recreation on the Wild and Scenic Rogue River" commissioned by the Save the Wild Rogue Campaign, dated January 2009 907
Kukowski, Dave:
Letter for the Record 97
Kukowski, Michael and David:
Statement for the Record 98
Lee, Hon. Mike:
Opening Statement 1
Lindoff, Jr., James M.:
Letter for the Record 79
Littlefield, Michael:
Letter for the Record 46
Lucky Minerals Inc.:
Letter for the Record 951
Maxey, Clarence:
Letter for the Record 103
McKinley Sr., Alfred:
Letter for the Record 68
Mills, Anthony Gilbert:
Letter for the Record 70
Mills, George N.:
Letter for the Record 71

Page

Mills, Robert D.:
Letter for the Record 48
Mojave Desert Land Trust:
Letter for the Record 237
Monroe, Nick:
Letter for the Record 43
Montana Wildlife Federation:
Letter for the Record 954
Morris, Jake E.:
Letter for the Record 67
Murkowski, Hon. Lisa:
Opening Statement 7
List of Letters, Statements, and Resolutions in support of S. 785, S. 884, S. 1149 10
National Parks Conserviation Association:
Letter for the Record regarding S. 32 dated January 11, 2017 231
Letter for the Record regarding S. 32 dated July 25, 2017 956
Letter for the Record regarding S. 941 957
National Parks Conservation Association, et al.:
Letter for the Record 958
Native Village of Barrow, Inupiat Traditional Government:
Resolution #2009–18 for the Record 21
Neimeyer, A. Michael:
Statement for the Record 961
Neketa, Nick:
Letter for the Record 53
Organized Village of Kake:
Resolution #2009–06 for the Record 19
Parnell, Frank:
Letter for the Record 76
Paul, Sr., Ronald L.:
Letter for the Record 73
(The) Pew Charitable Trusts:
Letter for the Record regarding S. 32 239
Statement for the Record regarding S. 32 and S. 1548 963
Phillips, John:
Letter for the Record 52
Pilot Point Traditional Council:
Resolution for the Record 20
Powers, Marlys A.:
Letter for the Record 41
Prett, Willis P.:
Letter for the Record 72
QuadState Local Governments Authority:
Statement for the Record 966
Robertson's:
Letter for the Record 266
Ruhs, John:
Opening Statement 127
Written Testimony 129
Responses to Questions for the Record 189
San Bernardino County (CA):
Letter for the Record 254
San Bernardino Valley Municipal Water District:
Letter for the Record 260
Resolution 1036 for the Record 261
Sealaska Corporatioon:
Letter for the Record 25
Semaken, Harold J.:
Letter for the Record 45
Sifsof, Lawrence D.:
Letter for the Record 81
Silas, Franklin R.:
Letter for the Record 63
Sitka Tribe of Alaska:
Resolution #2009–85 for the Record 17

Page

Southeast Alaska Conservation Council:
Letter for the Record 969
Southern Utah Wilderness Alliance:
Letter for the Record 971
Strong, James B.:
Letter for the Record 35
Student Conservation Association:
Letter for the Record 235
Suckling, Theodore D.:
Letter for the Record 44
Sullivan, Hon. Dan:
Statement for the Record 973
Tanana Chiefs Conference:
Letter/Resolution for the Record 27
Tester, Hon. Jon:
Opening Statement 105
Photo 1—Chico Hot Springs 106
Photo 2—Outside Yellowstone National Park (near Gardiner, Montana) ... 108
Photo 3—Off Highway 89 (Paradise Valley, Montana) 110
Thomas, Sherman A.:
Letter for the Record 66
Thurneau, Vernon A.:
Statement for the Record 99
Tobuk, Homer:
Letter for the Record 40
Traditional Council of Togiak:
Resolution #2009–06 for the Record 24
Trautner, John J.:
Statement for the Record 83
Trout Unlimited:
Letters for the Record 975
Ugashik Traditional Village Council:
Resolution #2009–11 for the Record 23
U.S. Forest Service, U.S. Department of Agriculture:
Statement for the Record regarding S. 1149 981
U.S. Department of the Interior:
Statement for the Record regarding S. 1230 171
Washington County (Utah) Commission:
Resolution No. R-2017-2219 982
Washington County (Utah) Water Conservancy District:
Letter for the Record 984
Wells, Bryan, Sally & family:
Letter for the Record 985
White, Sr., David:
Letter for the Record 78
White, Sr., Frank C.:
Letter for the Record 69
Wild Rogue Outfitters Association, et al.:
Letter for the Record 988
(The) Wilderness Society:
Letter for the Record 990
Williams, Norma J.:
Letter for the Record 62
Yellowstone Gateway Business Coalition:
Letter for the Record 994
Park County Commission Letter 996
Yellowstone Gateway Business Coalition Membership List as of July 17, 2017 998
Report by Dr. Larry Swanson titled "Key Trends, Dependencies, Strengths and Vulnerabilities in Park County, Montana, and its Area Economy," April 2016 1004

Page

Yellowstone Gateway Business Coalition—Continued
Report titled "Park County's Growing Economy: Southwest Montana region uniquely positioned for continued economic success," 2016 1061

The text for each of the bills which were addressed in this hearing can be found on the Committee's website at: https://www.energy.senate.gov/public/index.cfm/2017/7/subcommittee-hearing-on-various-bills

PENDING LEGISLATION

WEDNESDAY, JULY 26, 2017

U.S. SENATE,
SUBCOMMITTEE ON PUBLIC LANDS, FORESTS, AND MINING,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The Subcommittee met, pursuant to notice, at 9:45 a.m. in Room SD–366, Dirksen Senate Office Building, Hon. Mike Lee, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. MIKE LEE, U.S. SENATOR FROM UTAH

Senator LEE [presiding]. The Subcommittee will come to order. This is our first legislative hearing in the Public Lands, Forests, and Mining Subcommittee during this Congress.

The purpose of today's hearing is to receive testimony regarding 15 separate legislative proposals pending before this Subcommittee. Because of the large number of bills on today's agenda, I am not going to go through all of them in their entirety, but the complete agenda will, of course, be included in the record.

[The complete agenda referred to follows:]

UNITED STATES SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

SUBCOMMITTEE ON PUBLIC LANDS, FORESTS, AND MINING

July 26, 2017 Hearing regarding Pending Legislation

AGENDA

- **S. 32**, California Desert Protection and Recreation Act
- **S. 90**, Red River Gradient Boundary Survey Act
- **S. 357**, Santa Ana River Wash Plan Land Exchange Act
- **S. 436**, San Juan County Settlement Implementation Act
- **S. 467**, Mohave County Federal Land Management Act
- **S. 468**, Historic Routes Preservation Act
- **S. 614**, Recreation and Public Purposes Act Commercial Recreation Concessions Pilot Program Act
- **S. 785**, Alaska Native Veterans Land Allotment Equity Act
- **S. 837**, Southern Utah Open OHV Areas Act
- **S. 884**, Small Miners Waiver Act
- **S. 941**, Yellowstone Gateway Protection Act
- **S. 1149**, To amend the Alaska Native Claims Settlement Act to repeal a provision limiting the export of timber harvested from land conveyed to the Kake Tribal Corporation
- **S. 1230**, Water Rights Protection Act
- **S. 1271**, Fowler and Boskoff Peaks Designation Act
- **S. 1548**, Oregon Wildlands Act

Senator LEE. About half of these bills were considered in this Committee in the last Congress. We are going to update the record on these bills. The remaining bills have not yet been considered.

I would like to comment on three of these bills starting with S. 837, the Southern Utah Open OHV Areas Act, sponsored by my colleague from Utah, Senator Hatch. This bill preserves recreational access to nearly 20,000 acres in the Hurricane Sand Dunes in Washington County, Utah. A unique blend of slick rock terrain and expansive sand dunes makes this an ideal spot for off-highway vehicle riders, but federal land managers have significantly, and often unjustifiably, reduced recreational access in the area over the past two decades. S. 837 will guarantee that local residents and tourists from across the country continue to have open access to this land. Apart from what this bill does, it is also a good example of how federal land management decisions ought to be made. This bill is the result of locally-driven collaborative processes that empower local stakeholders instead of federal bureaucrats. You will hear more about this bill from Senator Hatch in a few minutes.

The second bill I would like to highlight is S. 1230, Senator Barrasso's Water Rights Protection Act, which prohibits federal land managers from requiring water rights transfers as a condition of granting or renewing permits and leases on public lands. This bill is necessary to stop federal intrusions into long-established state water authority and to protect private water rights from an increasingly aggressive Federal Government. In recent years, the Forest Service has attempted to strong-arm farmers and ranchers by threatening to withhold grazing and other land use permits unless the farmers and ranchers agreed to give up on the water rights. Moreover, the Forest Service's 2014 Groundwater Resource Management Directive sought to usurp state authority over groundwater resources in the National Forest System. The Forest Service rescinded that directive, but the agency continues to express a desire for more control over water resources. The Water Rights Protection Act would end this unwarranted encroachment on state and private water rights.

Finally, I would like to highlight S. 468, Senator Flake's Historic Routes Preservation Act, which establishes a much-needed process for resolving disagreements over road claims under R.S. 2477. In 1866, Congress granted public rights-of-way across federal lands that were not already reserved for other uses. Many of these roads, known as R.S. 2477 roads, are still in use today and provide recreational access and economic opportunities for local communities. However, because the original law did not require documentation of these roads, disputes have arisen between local governments and the Bureau of Land Management (BLM) as to who owns the rights-of-way. This has led to costly drawn-out legal battles in court.

My home State of Utah spent years trying to negotiate with the Federal Government to settle its R.S. 2477 claims. Its efforts ultimately failed because the Federal Government forced the state to prove its claims in court. The state has since filed 22 lawsuits to settle nearly 12,000 road claims. The Historic Routes Preservation Act would end this inefficient, unfair, and wasteful system by giving local governments a well-defined administrative process to doc-

ument ownership of their R.S. 2477 rights-of-way which Congress granted to them over 150 years ago.

I would also like to note that some of the bills before the Committee today involve various land designations and large mineral withdrawals. The United States has one of the longest permitting processes for mining in the world and vast amounts of federal land are already off-limits. It should come as no surprise that our country is at least 50 percent import dependent for 50 minerals and 100 percent import dependent for 20 minerals. This makes little sense when we have been blessed with an abundance of these minerals right here at home. Before we withdraw more lands from mining, we should look for opportunities to open other lands that can be developed safely and responsibly.

With that, I want to thank our witnesses for being here as well as Senator Hatch and Senator Tester, both of whom are here to talk today about their bills.

We would be turning to Senator Wyden right now for his opening remarks, but I am not seeing Senator Wyden.

Okay, with that I am going to turn to Senator Barrasso, who needs to make his opening statement before he has to go chair another hearing.

STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM WYOMING

Senator BARRASSO. Well, thank you very much, Chairman Lee. I appreciate you holding this important hearing.

I want to thank Mr. Casamassa as well as Mr. Ruhs for being here today to testify.

There are a number of important bills on the agenda and I would just like to echo what you had said, Mr. Chairman, by highlighting the bill that I have introduced, the Water Rights Protection Act.

S. 1230, the Water Rights Protection Act, seeks to protect Western communities, farmers, ranchers, and people who rely on privately held water rights for their livelihood from blatant federal overreach. In recent years, Mr. Chairman, we have seen the Federal Government repeatedly try to circumvent longstanding state water law and seize private water rights. This is absolute federal overreach. It violates private property rights.

One such example, and you mentioned it Mr. Chairman, that many of us here today are very familiar with is the Groundwater Resource Management Plan proposed by the Forest Service in 2014. This plan would have imposed unjust water use restrictions and denied agricultural and recreational activities that communities depend upon for their economic viability. All of this would have been done without receiving input from the impacted communities. The proposal has since been withdrawn due to the blatant overreach in authority.

S. 1230 will require any future land use agreements to recognize states' longstanding authority related to protecting, evaluating and allocating groundwater resources.

So, Mr. Chairman, I appreciate you including S. 1230 on the hearing agenda today and the schedule, and I look forward to hearing testimony from the witnesses.

Thank you, Mr. Chairman.

Senator LEE. Thank you, Senator Barrasso.

I am also told that Senator Daines has another hearing to go to. Did you want to make a statement?

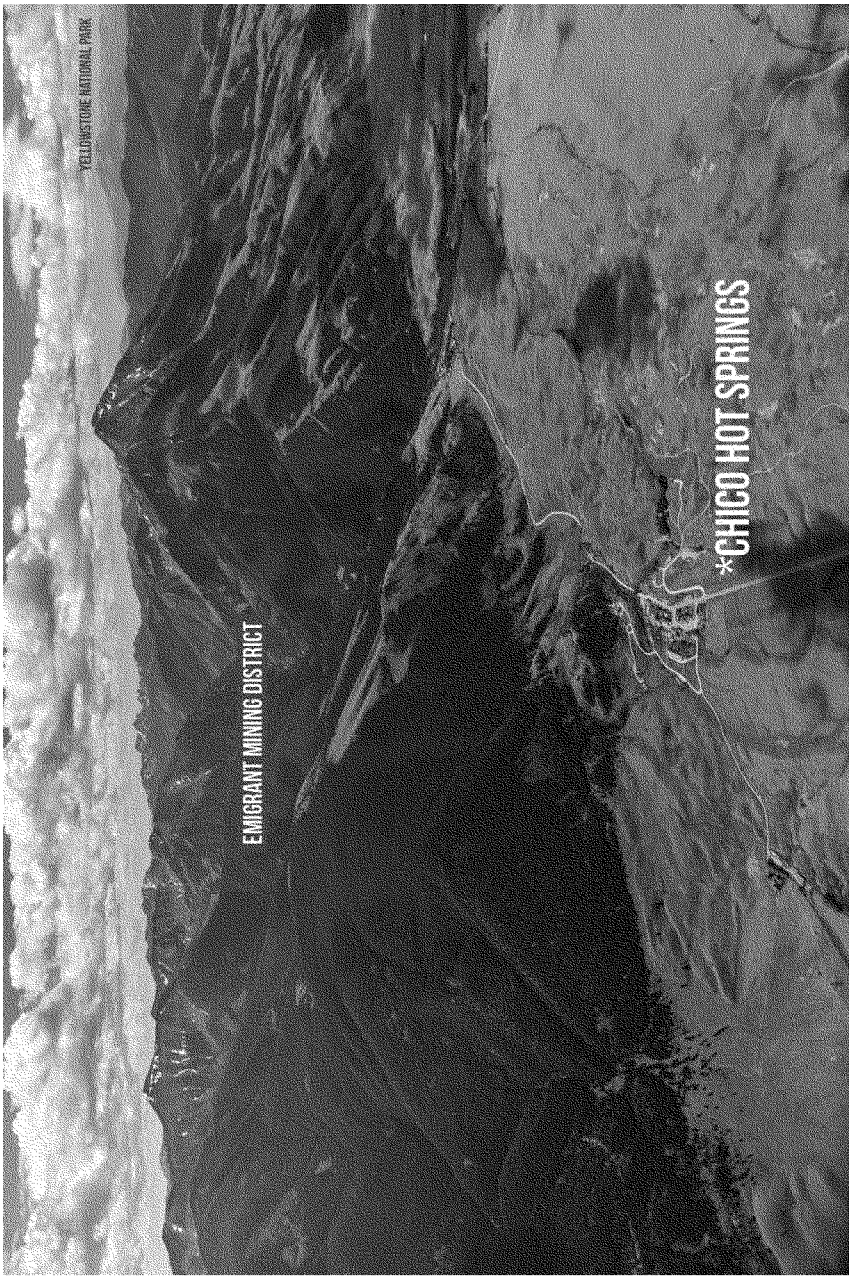
STATEMENT OF HON. STEVE DAINES, U.S. SENATOR FROM MONTANA

Senator DAINES. Yes. Thank you, Mr. Chairman and Ranking Member Wyden for holding this hearing on a very important piece of legislation for Montana. This is Senator Tester's Yellowstone Gateway Protection Act.

In fact, as I look at the chart the Senator has brought I am getting homesick. Chico Hot Springs is where I spent my senior prom, taking the Griswold station wagon right there back in 1979. So it is a very special place in Montana. And in fact, the Absaroka-Beartooth Wilderness is in the distance. That is where my wife and I and family spend a lot of time backpacking on top of some of those peaks that you see in the horizon.

This legislation is important as it would protect an area in Montana that we call Paradise Valley. It is called Paradise Valley for a reason. This area is home to some renowned outdoor recreation opportunities: world-class fly fishing—if you come by my office you will see me holding a nice, big, brown trout caught on the river, the Yellowstone River, that runs right by Chico Hot Springs; hiking; rafting; and hunting. My son killed his first elk just north of that picture. I can just about see the hillside it happened on.

[The picture referred to follows:]


YELLOWSTONE NATIONAL PARK
EMIGRANT MINING DISTRICT
*CHICO HOT SPRINGS

Senator DAINES. This is a very special place. It is home to many businesses that serve those that are visiting Yellowstone National Park and the surrounding area. Simply stated, the economy in this area thrives on our outdoor way of life.

I am committed to working with Senator Tester and local stakeholders on this important piece of legislation. My staff and I have had at least 30 meetings, discussions with residents, local stakeholders' groups, as well as with Senator Tester and his team. I thank everyone that has participated in these meetings. It is important to me that in any major land decision like this one the local community stands firmly behind it.

The county commissioners, the local elected officials, local businesses, and outdoor businesses like the fly fishing industry support a withdrawal. I can say with confidence that after the meetings I have had that most all the community does stand with this idea of a withdrawal.

The opposition to mining in the Paradise Valley contrasts to support for mines we have in other parts of our state, like the Montanore and Rock Creek in the northwestern part of Montana. That is in Lincoln County. Up in that region, on the other hand, the county commissioners, the local elected officials, the businesses, and the school system support these mines. In fact, we have the Stillwater mine. If you look at that chart, the Stillwater mine actually is adjacent to that same wilderness area, just a little further to the east and a little further to the north. It is a major economic driver in Montana. The mine, sitting immediately adjacent to a wilderness area, produces platinum and palladium. In fact, it is the only palladium producer in the U.S. It has wide local and statewide support and has operated on the edge of this wilderness area for decades, proving that mines can be environmentally friendly and enjoy local support. These are high-paying jobs, and it is important that our state continues to support them.

So in Montana, as I have often said, it is a blend of John Denver and Merle Haggard. That is the Montana melody. I look forward to further exploring this legislation later today.

Senator LEE. Thank you, Senator Daines.

Chairman Murkowski.

STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

The CHAIRMAN. Thank you, Mr. Chairman. I appreciate the opportunity to speak to a few bills that are on the docket this morning. And thank you for your leadership on the Subcommittee for scheduling this hearing.

The first bill that we have before the Subcommittee this morning on the Alaska side is S. 785. This is the Alaska Native Veterans Land Allotment Equity Act. This is something that I have been working on with Congressman Young. He has been leading on the House side for years, and I have picked this up over here. Now I am very proud that Senator Sullivan is taking the lead on it, and I am co-sponsoring it.

Our bill amends legislation that Congress passed back in 1998 to convey land to Alaska Natives who served in our U.S. military during the Vietnam War. There were many who served who did not

receive the lands that they had been promised under the 1906 Native Allotment Act simply because they were outside of the country. They could not complete their applications.

We passed the 1998 bill to remedy this problem, but of the 3,000 Alaska Natives who were eligible for lands, there were only about 243 allotments that have actually been conveyed. And the delay is due to three issues: first, Alaska Native Veterans could not select lands unless they had used them for subsistence for five years prior to passage; second, the Act did not cover the entire span of the Vietnam War; and third, lands withdrawn by the Federal Government were not eligible for selection. So the result then is that you have many Alaska Native Vietnam Vets that had very few lands to select from and still decades later have not received their allotments. This is a difficult inequity that is really hard to comprehend, much less accept. We have been working with Secretary Zinke on this. And again, I really applaud Senator Sullivan for the efforts that he has made to advance this. S. 785 would solve these problems and properly honor our Alaska Native Veterans for their service to our country during the Vietnam War.

The second bill, S. 884, is the Small Miners Waiver bill. What happens is when small miners apply for a waiver from fees under the Mining Law of 1872, they have no right to appeal if they lose their claims or if anyone makes a mistake during the application process. Most federal agencies provide permit holders notice if they are about to forfeit a valuable right.

For example, the Federal Communications Commission (FCC) gives all amateur radio license holders notice when their permits are about to expire. But at the BLM, if a miner's fees or their paperwork is even a day late in arriving they forfeit their claims and, in many cases, this is their livelihoods and they have no chance for an appeal. I think that this is unfair. I do not think it was the intent of the claim fee waiver process that Congress put in place in 1993. That is why my bill will finally provide our small miners with due process and reinstate a handful of claims that clearly deserve to be restored.

The last bill that I want to address is S. 1149 which would repeal the timber export ban for the Village of Kake in southeast Alaska. Back in 2000, Congress approved a complex land exchange involving the Kake Village Native Corporation. In return for giving up timberlands in the village as watershed, the corporation was to receive replacement lands plus compensation to make up the difference in value of the lands exchanged. At the time, Kake was prohibited from exporting its timber in order to ensure that there be a timber supply for the local sawmills. But it is the only Alaska Native Corporation that is unable to export its timber into higher value markets. This ban has proven to be unworkable and discriminatory because the timber the Corporation gained in the land exchange is only valuable for sale in export markets.

So what we do with this bill is allow Kake citizens to effectively be treated like all other Alaska Natives to gain financial benefit for the acreage that they gave back to the Forest Service. The bill will not harm Alaska jobs in any way. It just does the right thing by lifting this lone export ban.

Mr. Chairman, I do hope that all of these bills can become law this Congress. I have letters and statements in support for all three that I ask unanimous consent to submit for the record. While I recognize the Administration is still reviewing the Kake bill, I certainly appreciate its supportive testimony on our Vietnam Veterans Allotment bill and the Small Miners Waiver Relief Act.

So again, Mr. Chairman, thank you for the courtesy this morning.

Senator LEE. Thank you, Madam Chair.

Anything you submit will be admitted into the record, without objection.

[The information referred to follows:]

Letters and statements in support of the three Alaska bills to be submitted for the record:

S. 785: Alaska Native Veterans Land Allotment Equity Act:

- Statement from Nelson Angapak Sr., representing the Alaska Federation of Natives
- Resolution, Sitka Tribe of Alaska, #2009–85
- Resolution, Organized Village of Kake, #2009–06
- Resolution, Pilot Point Traditional Council, Sophie Abyo, Tribal President
- Resolution, Native Village of Barrow, lnupiat Traditional Government, #2009–18
- Resolution, Ugashik Traditional Village Council, #2009–11
- Resolution, Traditional Council of Togiak, #2009–06
- Statement, Anthony Mallott, representing Sealaska Native Regional Corp.
- Resolution/Letter, Victor Joseph, President, Tanana Chiefs Conference
- Resolution/Letter, Richard J. Peterson, President, Tlingit & Haida Central Council
- Letter, Nels Anderson Jr., veteran, Dillingham
- Letter, James Strong, veteran, Haines, Alaska
- Resolution, Alaska State Legislature, 2006
- Letter, Homer Tobuk, veteran, Allakaket
- Letter, Marlys A. Powers, relative of a veteran, Fairbanks
- Letter, Patrick Huff, veteran, Fairbanks
- Letter, Nick Monroe, veteran, Nenana
- Letter, Theodore D. Suckling, veteran, Tanana
- Letter, Harold J. Semaken, veteran, Anchorage
- Letter, Michael Littlefield, veteran, Southeast Alaska
- Letter, Percy Hunter Jr., no town given
- Letter, Robert D. Mills, Kake
- Letter, David A. Bran, former Juneau resident, now of West Jordan, UT
- Letter, James Gray, veteran, Kenai
- Letter, John Phillips, veteran, Perryville
- Letter, Nick Neketa, veteran, Pilot Point
- Letter, Albert Frank, veteran, Venetie
- Letter, Roger M. Jones, Native veteran, Oakridge, OR
- Letter, John B. Andrews Jr., for Benny Andrews, Anchorage
- Letter, Wayne Huntington, veteran, no home town given
- Letter, Norma J. Williams, sister of veteran Andrew Williams, no home town given
- Letter, Franklin R. Silas, veteran, no home town given
- Letter, George H. Koonaloak, veteran, Point Hope
- Letter, Valerie J. Dewey, veteran, Fairbanks
- Letter, Sherman A. Thomas, veteran, no home town given
- Letter, Jake E. Morris, veteran, Juneau
- Letter, Alfred McKinley Sr., veteran, Juneau
- Letter, Frank C. White Sr., veteran, Juneau
- Letter, Anthony Gilbert Mills, veteran, Hoonah
- Letter, George N. Mills, veteran, Hoonah
- Letter, Willis P. Prett, veteran, Hoonah
- Letter, Ronald L. Paul Sr., veteran, Hoonah

- Letter, Everett J. Glover, veteran, Hoonah
- Letter, Ray Henry, veteran, Hoonah
- Letter, Frank Parnell, veteran, Hoonah
- Letter, John W. Graves, veteran, Juneau
- Letter, David White Sr., veteran, Juneau
- Letter, James M. Lindoff Jr., veteran, Juneau
- Letter, Darrell T. Brown, veteran, Juneau
- Letter, Lawrence D. Sifsof, veteran, Dillingham
- Letter, Mrs. Jake A. Aloysius Jr., heir of a veteran, Holy Cross

S. 884: Small Miners Waiver Act:

- Statement and backup from John J. Trautner, Girdwood, Alaska
- Email, statement by Michael Kukowski, miner near Chicken, Alaska
- Email, statement by David Kukowski, miner near Chicken, dated 7–31–17
- Email from Vernon Thurneau, miner, The Fortymile District
- Statement from David Guthert, miner, Juneau, (once translated by Dominic)

S. 1149: Kake Tribal Council Timber Export Ban Repeal:

- Letter, testimony, Kake Tribal Corporation, Robert Mills, CEO, President
- Letter, Clarence Maxey, Frontier Inc., Sandpoint, Idaho

Written Testimony of Nelson N. Angapak, Sr.
The Alaska Federation of Natives
To the Senate Energy and Natural Resources Subcommittee on
Public Lands, Forests and Mining
In support of S.785, To amend the Alaska Native Claims Settlement Act
to provide for equitable allotment of land to Alaska Native veterans.
July 26, 2017

My name is Nelson N. Angapak, Sr.; and I am a Yupik Alaska Native and a U. S. Army veteran, 1969 to 1971. I serve as Special Assistant to the President of Alaska Federation of Natives (AFN) on Native Allotments. I am submitting this written testimony on behalf of AFN in support of S. 785, a bill to amend the Alaska Native Claims Settlement Act such that it provides for equitable allotment of land to Alaska Native veterans of the Vietnam War Era. AFN is the largest statewide Native organization in Alaska. Our membership includes 165 federally recognized tribes, 146 village corporations, 12 regional corporations, and 12 regional nonprofit and tribal consortiums that compact and contract to run federal and state programs. Formed more than fifty years ago, AFN continues to be the principle forum and voice of Alaska Natives in dealing with critical issues of public policy and government that are important to the Alaska Native Community.

History

Alaska Natives and Native Americans have a long and proud history of military service, serving in greater numbers on a per capita basis than any other ethnic group in the United States of America. More than 42,000 Alaska Natives and Native Americans served in the military in the Vietnam Era, and over 90% of these service men and women enlisted as opposed to being drafted.[1]

While the Vietnam War was being fought, our Alaska Native land rights were being settled by Congress. Section 18 of P. L. 92-203, Alaska Native Claims Settlement Act of 1971 (ANCSA), extinguished the applicability of the Alaska Native Allotment Act of 1906 insofar as the Alaska Natives are concerned. Some Alaska Native groups saw this change coming and worked by themselves or partnered with Alaska Legal Services and VISTA workers to get as many Alaska Natives as they could to apply for allotments before ANCSA became law, however, communication was a big challenge.

In 1967, remote communities in Alaska were served not by satellite but by 14 land radio stations that tied into 300 bush radios. Eighty-eight villages needed improved telephone service, 72 had only "bush" telephone service, and 16 had no telephone service at all. By 1970, 141 of Alaska's 287 communities still had no satisfactory telecommunication ties. Of the 146 with those ties, 84 depended on White Alice or less sophisticated systems. Sixty-two were linked to the rest of the

[1] http://www.bia.gov/WhoWeAre/BIA/OJS/ojs-careers/history/index.htm

world by microwave or cable systems.[2] For example, in my village of Tuntutuliak, there was one telephone that served more than 200 people living in the village at the time.

Also complicating matters was the fact that there were twenty Alaska Native languages spoken around the state at that time. Many of our people spoke little or no English. Translating complicated concepts like Western ideas of land ownership was difficult at best.

Case in point: within the Yupik Society, an accepted and honored practice was the concept of land usership. In practice, this is how this worked. Along the Kinak River where Tuntutuliak, Alaska is located, certain tract of land was used by Pukkaq family (Paul Andrew) generation to generation for salmon berry picking; other families outside of Pukkaq family respected this, and to honor this, they never used that tract of land to pick berries unless they had a specific authorization issued by Pukkaq. Paul Andrew applied for this tract of land as his Native Allotment. This was strictly followed and when the Vista workers, in late 1960s, initially suggested to the Yupik people living at Tuntutuliak, they initially refused to apply for Native Allotments and one of their biggest reasons was that they know where the land they used was located and that the other family members respected these and would not use them.

Although virtually all Alaska Natives were eligible to apply for land that had been used by themselves and their families and other relatives for subsistence purposes for generations, in the first 64 years of the Alaska Native Allotment Act of 1906, only 245 allotments were approved, according to Alaska Legal Services.[3]

Given the state of communications in Alaska in the late 1960s and early 1970s, it was hard for the Alaska Native people in Alaska to apply for Native allotments. It was logistically impossible for Native men and women serving in active duty in the military service to apply for allotments even though they were eligible.

It was in 1994 that AFN began its efforts of amending ANCSA such that the Alaska Native veterans of the Vietnam War Era would regain their right to apply for Native Allotments.

1998 Veterans Allotment Act

In October of 1998, a week to 10 days prior to the 1998 AFN Convention, the late Ted Stevens, then Chairman of the U. S. Senate Committee on Appropriations, amended the U. S. Department of Veterans Affairs' budget by adding legislative language that amended Section 18 of ANCSA such that Alaska Native veterans who served in active duty in the U. S. Armed Forces from January 1, 1969 to December 18, 1971, and who were honorably discharged could apply for Native Allotments. He was assisted by his close political ally and friend, the late Daniel K. Inouye. President Bill Clinton had pressed Senator Stevens to move the U. S. Department of Veterans Affairs' budget as the American public demanded better medical treatments for veterans at the time.

---

[2] From the Alaska History and Cultural Studies Website, Chapter 4-13 Communications, available at http://www.akhistorycourse.org/articles/article.php?artID=178

[3] Excerpt from the statement of Nelson N. Angapak, Sr. Vice President, Alaska Federation of Natives, on H.R. 3350 November 14, 2007, in front of U. S. House Committee on Natural Resource

When it passed, the Alaska Native Veterans Land Allotment Equity Act (Act) of 1998 authorized the Alaska Natives who served in active duty in the U. S. Armed Forces for at least six months during 1969 through 1971 and were honorably discharged to apply for Native allotments within 18 months of the implementation of rules that were promulgated pursuant to this Act. Because of this, approximately 1110 Alaska Natives who served in active duty in the U. S. Armed Forces during that time became eligible to apply for Native allotments.

Senator Stevens told AFN that the best he could do then was these three years, and that he and Senator Inouye were both supporting this approach. Inouye served as Vice Chair of the Appropriations Committee and Chairman of the U. S. Senate Committee on Commerce at the time.

By the Numbers

We put together the following statistics after researching the land records of Bureau of Land Management:

- 1,071 Alaska Native veterans of the Vietnam War applied for Native Allotments pursuant to the existing authority as authorized by The Alaska Native Vietnam Veterans Act, PL-105-276.[4] It is assumed the majority of the applicants applied for the maximum acreage authorized, 160 acres.

- Of those applications, 432 were certified, or approved, by the Bureau of Land Management[5] involving a total of 26,914.78 acres of land.

The Bureau of Land Management rejected a total of 639 applications for Native Allotments by the Nam veterans representing a total of 69,176.29 acres of lands.[6] The following is a summary of the primary reasons for the rejections:

1. 175 applications were rejected because the cause of applicant's demise was other than those set out in the regulations.

2. 124 applications were rejected because lands were no longer in federal ownership. These lands may have been transferred to the State of Alaska or the ANCSA corporations.

3. 74 applications were rejected because the Lands were withdrawn for national conservations systems as follows: Tongass National Forest: 49; Chugach National Forest: 15; National Wildlife Refuges: 6; Annette Island Reserve: 3; National Parks: 1

4. 266 Native Allotment applications by the Alaska Native veterans of the Nam Era were rejected for other reasons.

---

[4] Bureau of Land Management regarding PL 105-276
[5] Ibid
[6] Ibid

136 of the Alaska Native veterans appealed the rejections of their applications;[7] the record seems to indicate that all the appeals were unsuccessful. P.L. 105-276 mandates that veterans can only apply for lands that are vacant, unappropriated, and unreserved. As you know, almost all of the lands in Alaska are appropriated and reserved, so veterans were very limited on where they could select land for Native Allotments.

One of the most stunning and alarming things that occurred during the implementation of the 1998 Native Allotment Statute was that **all the parcels of land applied for as Native Allotments by the Alaska Native veterans who became eligible under the 1998 statute in the following regions were rejected: Sealaska Corporation, Cook Inlet Region, Inc., Chugach Alaska Corporation, and the Arctic Slope Regional Corporation.**

In the Sealaska Region, the primary reason for the rejections of lands applied for as Native Allotments is because the creation of the Tongass National Forest predates the lands applied for as Native Allotments by Alaska Native veterans of the Vietnam War. The Tongass National Forest, the nation's largest national forest, was created by President Theodore Roosevelt by a Presidential Proclamation on 10 September 1907.[8]

In the Cook Inlet Region, Inc. and the Chugach Alaska Corporation, the primary reason for the rejections of lands applied for as Native Allotments is because the creation of the Chugach National Forest predates the lands applied for as Native Allotments. The Chugach National Forest was created as a national forest on July 23, 1907.[9] In addition to this, almost all the lands located in these regions of Alaska are owned privately or were selected by the State of Alaska.

In the Arctic Slope Region, the creation of the National Petroleum Reserve – Alaska (NPR-A), the Arctic National Wildlife Refuge, the Gates of the Arctic National Park and Preserve predated the veterans' allotment applications. The NPR-A was created in 1923.[10] President Eisenhower established ANWR in 1960.[11] Gates of the Arctic was declared a National Park and Preserve in the Alaska National Interest Lands Conservation Act, which became law in 1980.[12]

Another issue veterans faced in trying to apply for allotments under the 1998 Act was confusion in the Bureau of Indian Affairs—we heard from one veteran who drove 400 miles round-trip from his village to Anchorage to apply for an allotment and he said the BIA did not know what he was talking about so he never applied.

S. 785

S.785, the current bill, will allow Alaska Native veterans who served in active in the U. S. Armed Forces between August 5, 1964 and May 7, 1975 to apply for Native allotments. More than 2,800 Alaska Natives served in active duty in the U. S. Armed Forces during the Vietnam

[7] Ibid
[8] http://en.wikipedia.org/wiki/Tongass_National_Forest
[9] https://www.google.com/#q=chugach+national+forest
[10] http://www.blm.gov/ak/st/en/prog/energy/oil_gas/npra.html
[11] http://www.fws.gov/refuge/arctic/
[12] http://en.wikipedia.org/wiki/Gates_of_the_Arctic_National_Park_and_Preserve

War Era. We have lost a lot of veterans in the years since who would have qualified for allotments under this new bill, so we are pleased to see that it will allow the heirs to apply for allotments on behalf of the estates of those veterans.

As mentioned above, not one single allotment has been granted to anyone in the Southeast, CIRI, Chugach or Arctic Slope regions despite the many qualified and deserving veterans from those areas. This is wrong and must be rectified.

S. 785 expands the land base that veterans can select allotments from to include vacant public lands. In addition, this bill includes provisions that will allow Alaska Native Corporations and the State of Alaska voluntarily give land back to the federal government to transfer to a veteran as a Native allotment. If the State of Alaska and/or the ANCSA corporations voluntarily returns the land to the federal government for allotments, they would be authorized to select an equal amount of land to replace the lands they returned.

On May 30, 2017 representatives of AFN and a group of Alaska Native veterans met with the Honorable Dan Sullivan regarding S. 785. The veterans expressed their gratitude to Senator Sullivan for sponsoring S. 785. They also expressed their absolute support for the passage of S. 785. The Honorable Ryan Zinke, at the invitation of Senator Sullivan, Secretary of the Interior also attended this meeting. Zinke made a historic announcement to the veterans who were attending this meeting: The Department of the Interior is in full support of the passages of S. 785 and its U. S. House version, HR 1867 during the 115th Congress. This is the first time ever that the Department of the Interior has expressed their support for this type of a bill.

The Alaska Native community is united behind S. 785. The Alaska Federation of Natives respectfully urges Congress to amend the Alaska Native Vietnam Veterans Allotment Act to allow more Alaska Native Vietnam veterans to apply for and receive their Native allotments.

Conclusion

2017 marks the 42nd anniversary of the end of the Vietnam War.

The Vietnam War Era veterans are an aging group and many of them are dying and have died, this includes the American Indians and the Alaska Native veterans of that war. Some Alaska Native veterans who fought in the battlefield theaters of Southeast Asia are no longer with us and many will be gone before this year is over. Therefore, it is with some urgency that we ask you to pass S. 785 before the 115th Congress adjourns sine die.

If you have any questions regarding this written statement, please call me at 907-274-3611 or write to me at 3000 A Street, Suite 210, Anchorage, AK 99503.

Quyana, Thank you.

Sitka Tribe of Alaska
456 Katlian Street
Sitka, Alaska 99835

907-747-3207
Fax: 907-747-4915

Tribal Council Resolution 2009- 85

Resolution in Support of Amending the Alaska Native Claims Settlement Act to provide for equitable allotment of lands to Alaska Native Veterans

WHEREAS, Sitka Tribe of Alaska is the federally recognized tribal government for more than 4,020 enrolled tribal citizens in Sitka, Alaska organized under the Indian Reorganization Act of 1934 as amended; and

WHEREAS, the Sitka Tribe of Alaska is responsible for the health, safety, welfare and cultural preservation of its tribal citizens and their use of the Sitka Tribe's traditional territory; and

WHEREAS, the Sitka Tribe of Alaska's traditional territory reflects the lands and waters historically and presently the stewardship responsibility of the Sheet'ka Kwaan and as such are comprised of the western side of Baranof Island, the greater reaches of Peril Strait, southwestern portions of Chichagof Island an the myriad of islands as well as the waters between these locations; and

WHEREAS, Sitka Tribe of Alaska supports the rights of Alaska Natives to receive title to land under t he 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, a working group of representatives from 150 federally recognized tribal governments, AFN, AITC and Alaska Legal Services Corporation drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act;

WHEREAS, the technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing (1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest and (2) the reopening and legislative approval of all allotment cases closed under the *Shields'* court decision which required allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in that region was withdrawn on or before 1909;

NOW THEREFORE BE IT RESOLVED, that Sitka Tribe of Alaska supports the Alaska Congressional delegations efforts to amend the Alaska Native Veterans Allotment Act and to reopen the allotment cases that were closed under the *Shields'* decision.

CERTIFICATION

The foregoing resolution was adopted at a duly called and convened meeting of the Tribal Council of the Sitka Tribe of Alaska held on **May 20, 2009**, at which a quorum was present by a vote of **_6_IN FAVOR, _0_AGAINST, _0_ABSTAIN, _3_ABSENT**

Sitka Tribe of Alaska, Tribal Chairman

Attest:

Sitka Tribe of Alaska, Tribal Secretary

Organized Village of Kake
P.O. Box 316
Kake, Alaska 99830-0316
Telephone 907-785-6471
Fax 907-785-4902 / email KeexKwaan@ KakeFirstNation.org
(Federally Recognized Tribal Government serving the Kake, Alaska area)

Resolution No. 2009- 06 - SUPPORT IN AMENDING THE ALASKA NATIVE CLAIMS SETTLEMENT ACT to provide for equitable allotment of lands to Alaska Native veterans.

WHEREAS, the Organized Village of Kake (hereinafter OVK) is a duly constituted Indian Tribe organized pursuant to the authority of the Federal Indian Reorganization Acts (hereinafter IRA) of 1934 & 1936 with the IRA Council as the duly elected governing body formed under its *Constitution & By-Laws*; and,

WHEREAS, the Organized Village of Kake supports the rights of Alaska Natives to receive title land under the 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment Act;

WHEREAS, A working group of representatives from 150 federally recognized Tribal governments in Alaska, including Organized Village of Kake, Sitka Tribe of Alaska, Yakutat Tlingit Tribe Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inuplat Consortium, Maniilaq Association, Bristol Bay Native Association, Kawerak, Inc., Alaska Federation of Natives, Alaska Inter-tribal Council, and Alaska Legal Services Corporation, drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act;

WHEREAS, The technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing 1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest; and 2) the reopening and legislative approval of all allotment cases closed under the Shield's court decision which required allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in that region was withdrawn on or before 1909;

BE IT RESOVLED, the Organized Village of Kake support Senator Lisa Murkowski, Senator Mark Begich, Congressman Don Young, efforts to amend the Alaska Native Veterans Allotment Act and to reopen the allotments closed under the Shield's decision.

CERTIFICATION

This resolution was duly adopted at an IRA Council meeting held this 24th day of April, 2009 by a quorum of 7 (includes president as non-voting chairperson except in case of tie vote) with 6 yes votes, 0 no votes, and 0 abstaining.

Casimero A. Aceveda Jr. President

Attested by

Pilot Point Traditional Council
2200 Main Street * P O Box 449 * Pilot Point, Alaska 99649
Telephone (907) 797-2208 * Fax (907) 797-2258 * Internet *PIPCouncil@aol.com*

A RESOLUTION IN SUPPORT OF AMENDING THE ALASKA NATIVE CLAIMS SETTLEMENT ACT to provide for equitable allotment of lands to Alaska Native veterans.

WHEREAS: The Pilot Point Tribal Council supports the rights of Alaska Natives to receive title to land under the 1906 Alaska native Allotment Act and the 19998 Alaska Native Vietnam Veterans Allotment Act;

WHEREAS: A working group of representatives for 150 federally recognized Tribal governments in Alaska, including Sitka Tribe of Alaska, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inupiat Community of the Arctic North Slope, Tanana Chiefs Conference, Alaska Realty Consortium, Maniilaq Association, Bristol Bay Native Association, Kawerak, Inc., Alaska Federation of Natives, Alaska Inter-Tribal Council, and Alaska Legal Services Corporation, drafted Technical amendments to the Alaska Native Vietnam Veterans Allotment Act;

WHEREAS: the technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing 1) the opportunity for Alaska Natives who honorably served the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forrest; and 2) the reopening and legislative approval of all allotment cases closed under the Shield's court decision which would require allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in that region was withdrawn on or before 1909;

NOW THEREFORE BE IT RESOLVED that the Pilot Point Tribal Council support the Alaska Native Veteran's Allotment Act's efforts to amend the Alaska Native Veterans Allotment Act and to reopen the allotments closed under the Shield's decision.

ADOPTED this 11th day of May, 2009 BY Pilot Point Tribal Council by a vote of 3 ayes; 0 nays; 0 abstentions and ___ absences.

CERTIFY

Sophie Abyo

Sophie Abyo, Tribal President

ATTEST

Lori Ann Abyo

Lori Ann Abyo, Tribal Administrator

NATIVE VILLAGE OF BARROW IÑUPIAT TRADITIONAL GOVERNMENT

RESOLUTION NO. 2009-18

A RESOLUTION IN SUPPORT OF AMENDING THE ALASKA NATIVE CLAIMS SETTLEMENT ACT
To provide for equitable allotment of lands to Alaska Native Veterans.

WHEREAS, Native Village of Barrow is a federally recognized Tribe under the Indian Reorganization Act of 1934 (48 Stat. 378) amended by the Acts of June 15, 1935 (Stat. 378), and Alaska Act of May 1, 1936 (48 Stat. 1950) for Alaska Natives by the Act of Congress of the United States of America; and

WHEREAS, the Native Village of Barrow Iñupiat Traditional Government, acting as a duly recognized governing body pursuant to the Constitution of the Native Village of Barrow, has the authority to establish relationships and enter into contracts for the benefit and well being of the Tribe; and

WHEREAS, Native Village of Barrow supports the rights of Alaska Natives to receive title to land under the 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, A working group of representatives from 150 federally recognized Tribal governments in Alaska, including Sitka Tribe of Alaska, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inupiat Community of Arctic North Slope, Tanana Chiefs Conference, Alaska Realty Consortium, Maniilaq Association, Bristol Bay Native Association, Kawerak, Inc., Alaska Federation of Natives, Alaska Inter-Tribal Council, and Alaska Legal Services Corporation, drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, the technical amendments allow the Alaska Native Vietnam Veterans Allotments Act to be amended thereby providing 1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest; and 2) the reopening and legislative approval of all allotments cases closed under the Shield's court decision which required allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in the region was withdrawn on or before 1909; and

P.O. Box 1130 • Barrow, Alaska 99723 • Phone: (907) 852-4411 • Fax: (907) 852-8844

NOW, THEREFORE BE IT RESOLVED, that Native Village of Barrow supports the efforts of U.S. Senator Lisa Murkowski, U.S. Senator Mark Begich and U.S. Congressman Don Young's efforts to amend the Alaska Native Veterans Allotment Act and to reopen the allotments closed under the Shield's decision.

Adopted this 18th day of May, 2009 with a quorum present with a vote of 4 YES and 0 NO.

ATTEST:

Thomas Olemaun, President

Doreen Ahgeak, Secretary

UGASHIK TRADITIONAL VILLAGE COUNCIL

RESOLUTION 2009-11

A RESOLUTION IN SUPPORT OF AMENDING THE ALASKA NATIVE CLAIMS SETTLEMENT ACT TO PROVIDE FOR EQUITABLE ALLOTMENT OF LANDS TO ALASKA NATIVE VETERANS

WHEREAS, the Ugashik Traditional Village Council, hereafter (UTVC) is a FEDERALLY recognized Tribal Government and the official governing body for the Village of Ugashik, Alaska; and

WHEREAS, UTVC supports the rights of Alaska Natives to receive title to land under the 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, a working group of representatives from 150 federally recognized tribal governments in Alaska – including Sitka Tribe of Alaska, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inupiat Community of the Arctic North Slope, Tanana Chiefs Conference, Alaska Realty Consortium, Manilaq Association, Bristol Bay Native Association, Kawerak Inc., Alaska Federation of Natives, Alaska Inter-Tribal Council, and Alaska Legal Services Corporation – drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, the technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing (1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest; and (2) the reopening and legislative approval of all allotment cases closed under the Shield's court decision which required allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in that region was withdrawn on or before 1909;

NOW THEREFORE BE IT RESOLVED, that the Ugashik Traditional Village Council supports efforts to amend the Alaska Native Vietnam Veterans Allotment Act and to reopen the allotments closed under the Shield's decision.

Adopted this 21st day of May 2009 by the Ugashik Traditional Village Council by a vote of yeas; 5 nays; 0 abstentions; 0

CERTIFY;

Kristi Downing, Tribal President

Hannah M. Swanson

Hannah Swanson, Tribal Secretary

TRADITIONAL COUNCIL OF TOGIAK
P.O. Box 310
Togiak, AK 99678
Phone (907) 493-5003 / Fax (907) 493-5005
Email: tuyuryak@starband.net

RESOLUTION 2009-06

A RESOLUTION IN SUPPORT OF AMENDING THE ALASKA NATIVE CLAIMS SETTLEMET ACT to provide for equitable allotment of lands to Alaska Native Veterans.

WHEREAS, Traditional Council of Togiak supports the rights of Alaska Natives to receive title to land under the 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment Act;

WHEREAS, A working group of representatives from 150 federally recognized Tribal governments in Alaska, including Sitka Tribe of Alaska, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inupiat Community of the Arctic North Slope, Tanana Chiefs Conference, Alaska Realty Consortium, Manilaq Association, Bristol Bay Native Association, Kawerak, Inc., Alaska Federation of Natives, Alaska Inter-Tribal Council, and Alaska Legal Services Corporation, drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act;

WHEREAS, The technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing 1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest; and 2) the reopening and legislative approval of all allotment cases closed under the Shield's court decision which required allotment applications in southeast Alaska to have personally used the claimed even though all federal land in that region was withdrawn on or before 1909.

NOW THEREFORE BE IT RESOLVED that Traditional Council of Togiak supports Don Young's efforts to amend the Alaska Native Veterans Allotment Act and to reopen the allotments closed under the Shield's decision.

ADOPTED this 22nd day of May, 2009 by the Traditional Council of Togiak by a vote of 5 ayes; 0 nays, 0 absentations, and 2 absences.

CERTIFY

President

ATTEST

Tribal Secretary

July 27, 2017

The Honorable Mike Lee
Chairman
Subcommittee on Public Lands, Forests, and Mining
304 Dirksen Senate Office Building, Washington, D.C. 20510

The Honorable Ron Wyden
Ranking Member
Subcommittee on Public Lands, Forests, and Mining
304 Dirksen Senate Office Building
Washington, D.C. 20510

RE: Comments on S. 785, the Alaska Native Veterans Land Allotment Equity Act

Dear Chairman Lee and Ranking Member Wyden:

Sealaska Corporation is one of 12 Alaska Native Regional Corporations established pursuant to the Alaska Native Claims Settlement Act (ANCSA) of 1971. Sealaska's nearly 22,000 shareholders are descendants of the original Native inhabitants of Southeast Alaska – the Tlingit, Haida and Tsimshian people.

I am writing to convey Sealaska's strong support for S. 785, a bill to amend ANCSA to provide for equitable allotment of land to Alaska Native Vietnam-era veterans. Unfortunately, due to their service to the United States, many Native veterans did not have the opportunity to apply for a 160-acre allotment prior to the enactment of ANCSA, which repealed the Native Allotment Act. One of our Sealaska Board members, William "Bill" Thomas, is a Vietnam Veteran, and we stand behind him and other Alaska Native veterans on this issue.

In 1998, Congress amended ANCSA to provide many Alaska Native Vietnam-era veterans an opportunity to obtain an allotment of up to 160 acres of land under the Native Allotment Act. Unfortunately, several obstacles emerged that prevented many Native veterans from selecting and obtaining their allotments, including: 1) the land applied for must be "vacant, unappropriated and unreserved" when the applicant first began using the land; 2) an applicant could only apply if in active military duty between January 1, 1969 – December 31, 1971; and 3) the applicant must demonstrate continuous and independent use of the site for five or more years, which was not required for any other Alaska Native allotment applicants.

Sealaska • One Sealaska Plaza, Suite 400, Juneau, Alaska 99801-1276 • Tel: 907.586.1512 • Fax: 907.586.2304

The first obstacle prohibited Native veterans from selecting allotments in much of Alaska and ALL of Southeast Alaska due to the creation of the Tongass National Forest in 1907. In short, the 1998 amendment to ANCSA, while well-intentioned, essentially created an empty right for Native veteran allotment selections in many instances.

The bill currently before the subcommittee at least attempts to address two of those primary obstacles for potential Alaska Native veteran allotment applicants. First, S. 785 aims to increase the land available for Native veteran allotments by authorizing selections from within federally-owned vacant lands or State- or Native Corporation-owned lands. While there continue to be some limitations to protect conservation areas, the language certainly provides more flexibility. Second, S. 785 expands the military service dates to coincide with the entire Vietnam conflict, August 5, 1964 to May 7, 1975.

We appreciate your commitment to advancing S. 785, which addresses issues left unresolved in the 1998 amendment to ANCSA and provides redress for a legislative oversight that unfairly marginalized our Alaska Native veterans. These Alaska Native veterans at least deserve this consideration for their tremendous service to this country.

Respectfully,

SEALASKA CORPORATION

Anthony Mallott
President and CEO

CC: Senator Dan Sullivan
Senator Lisa Murkowski

Tanana Chiefs Conference
Chief Peter John Tribal Building
122 First Avenue, Suite 600
Fairbanks, Alaska 99701-4897
(907) 452-8251 Fax: (907) 459-3850

SUBREGIONS

UPPER KUSKOKWIM
McGrath
Medfra
Nikolai
Takotna
Telida

LOWER YUKON
Anvik
Grayling
Holy Cross
Shageluk

UPPER TANANA
Dot Lake
Eagle
Healy Lake
Northway
Tanacross
Tetlin
Tok

YUKON FLATS
Arctic Village
Beaver
Birch Creek
Canyon Village
Chalkyitsik
Circle
Fort Yukon
Venetie

YUKON KOYUKUK
Galena
Huslia
Kaltag
Koyukuk
Nulato
Ruby

YUKON TANANA
Alatna
Allakaket
Evansville
Fairbanks
Hughes
Lake Minchumina
Manley Hot Springs
Minto
Nenana
Rampart
Stevens Village
Tanana

This letter is sent by email only

October 1, 2015

Senator Lisa Murkowski
Washington D.C. Office
709 Hart Senate Office Building
Washington, DC 20510

Re: Support for S. 1955 – Alaska Native Veterans Land Allotment Equity Act

Honorable Lisa Murkowski:

(S 1955)

Tanana Chiefs Conference is writing in support of S. 1955.

Also attached please find letters of support that were sent to Congressman Don Young to support HR 2387 and a letter to Senator Dan Sullivan to support S. 1955.

We thank you for co-sponsoring this companion bill to HR 2387 and we would like to urge you to move both bills forward.

Sincerely,

Victor Joseph, President
Tanana Chiefs Conference

attachments

TRIBAL WORKING GROUP

RESOLUTION

February 1, 2013

TITLE: **A RESOLUTION IN SUPPORT OF AMENDING THE ALASKA NATIVE ALLOTMENT ACT AND THE ALASKA NATIVE VIETNAM VETERANS ALLOTMENT ACT**

WHEREAS: The Tribal Working Group met in Anchorage, Alaska on January 25, 2013 and resolved to request Congress to amend the Alaska Native Vietnam Veterans Act (43 U.S.C. §1629g).

WHEREAS: The Tribal working group representing 197 federally recognized Tribal governments and nonprofit organizations in Alaska, including Sitka Tribe, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes, Inupiat Community of the Arctic North Slope, Association of Village Council Presidents, Tanana Chiefs Conference, Chugachmiut, Maniilaq Association, Bristol Bay Native Association, Kawerak, Inc., Native Village of Point Hope, Tanana Tribal Council, Native Village of Selawik, Hoonah Indian Association, Alaska Federation of Natives and Alaska Inter-Tribal Council, drafted the technical amendments attached hereto to allow more Alaska Native Vietnam veterans to receive allotments and to reopen allotment cases rejected and closed under the decision in *Shields v. United States*, 698 F.2d 987 (9th Cir. 1983);

WHEREAS: Amending the Alaska Native Vietnam Veterans Allotment Act is necessary because the existing Act has provided only 229 certificated veteran allotments even though an estimated 3,000 Alaska Natives honorably served during the Vietnam era;

WHEREAS: So few veterans received an allotment under the Act primarily due to the lack of available land and the limited military service date requirements;

WHEREAS: The amendment's provision reopening the allotments closed under the decision in *Shields* is necessary to correct the unfair distribution of allotments in Southeast Alaska that resulted because of the rule that applicants must personally use the allotment land before the land is withdrawn when most of the land in southeast Alaska was withdrawn by 1909 for the Tongass National Forest encompassing almost 17 million acres;

WHEREAS: The Alaska State Legislature unanimously supports amending the Alaska Native Vietnam Veterans Allotment Act and reopening the *Shields* allotments as demonstrated by House Joint Resolution number 27 which was sent to Congress in 2006;

NOW THEREFORE BE IT RESOLVED that the Tribal Working Group requests the Alaska Congressional Delegation to introduce legislation to amend the Alaska Native Vietnam Veterans Allotment Act in order to allow more allotments for Native Vietnam veterans and to amend the Alaska Native Allotment Act to reopen the *Shields* allotments and to take actions that would move such legislation forward to a vote in 2013.

SUBMITTED ON BEHALF OF THE TRIBAL WORKING GROUP

BY: _____
Jerry Isaac, President/Chairman
Tanana Chiefs Conference

BY: _____
Edward K. Thomas, President
Central Council Tlingit and Haida Indian Tribes of Alaska

Tanana Chiefs Conference
Chief Peter John Tribal Building
122 1st Avenue Suite 600
Fairbanks, AK 99701

Central Council Tlingit & Haida Indian Tribes of Alaska
9097 Glacier Highway
Juneau, AK 99801-6922

This letter sent by email only

September 22, 2015

Senator Dan Sullivan
Washington D.C. Office
702 Hart Senate Office Building
Washington, DC 20510

Re: Support for S. 1955 – Alaska Native Veterans Land Allotment Equity Act

Honorable Dan Sullivan:

Central Council Tlingit & Haida Indian Tribes of Alaska and Tanana Chiefs Conference are writing in support of S. 1955. (S 1955)

We thank you for introducing this companion bill to HR 2387 and we would like to urge you to move both bills forward.

Sincerely,

Richard J. Peterson, President
Central Council

Will Mayo for

Victor Joseph, President
Tanana Chiefs Conference

CENTRAL COUNCIL
Tlingit and Haida Indian Tribes of Alaska
9097 Glacier Highway • Juneau, Alaska 99801

CENTRAL COUNCIL OF TLINGIT AND HAIDA INDIAN TRIBES OF ALASKA
Eightieth Annual Tribal Assembly
April 15-17, 2015
Juneau, Alaska

Resolution TA/ 15-04

Title: To Support Efforts to Amend the Alaska Native Veterans Allotment Act

By: Juneau Tlingit and Haida Community Council

WHEREAS, Central Council Tlingit & Haida Indian Tribes of Alaska (Central Council) is a federally recognized tribe with nearly 30,000 tribal citizens; and

WHEREAS, the Southeast Alaska Native Veterans represent Native Veterans in Southeast Alaska; and

WHEREAS, Southeast Alaska Native Veterans did not receive allotments under the Alaska Native Veterans Allotment Act of 1998; and

WHEREAS, the Amendment will allow the Alaska Native Vietnam Veterans Allotment Act to be amended by providing the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on federal land in Alaska which includes portions of the Tongass National Forest; and

WHEREAS, the amendments will reopen and legislatively approve allotment cases closed under the Shield's court decision which required allotment applicants in Southeast Alaska to have personally used the land claimed before it was withdrawn by the Tongass National Forest in 1909.

NOW THEREFORE BE IT RESOLVED, that the Eightieth Tribal Assembly of Central Council of Tlingit and Haida Indian Tribes of Alaska delegation convened in Juneau, Alaska on April 15-17, 2015, hereby supports Southeast Alaska Native Veterans efforts to amend the Alaska Native Veteran Allotment Act of 1998.

ADOPTED this 16th day of April 2015, by the Eightieth Tribal Assembly of Central Council of Tlingit and Haida Indian Tribes of Alaska.

CERTIFY

President Richard J. Peterson

ATTEST

for Tribal Secretary Jolene Edenshaw

CENTRAL COUNCIL
tlingit and haida indian tribes of alaska
ANDREW P. HOPE BUILDING
320 West Willoughby Avenue • Suite 300
Juneau, Alaska 99801-1726

CENTRAL COUNCIL OF TLINGIT AND HAIDA INDIAN TRIBES OF ALASKA
Seventy-Fourth Annual Tribal Assembly
April 15-18, 2009
Juneau, Alaska

Resolution TA/ 09-33

Title: **In Support of Amending the Alaska Native Claims Settlement Act to Provide for Equitable Allotment of Lands to Alaska Native Veterans.**

By: Sitka Tlingit and Haida Community Council

WHEREAS, Central Council of Tlingit and Haida Indian Tribes of Alaska (Central Council) is a federally recognized tribe of more than 26,000 tribal citizens; and

WHEREAS, Central Council supports the rights of Alaska Natives to receive title to land under the 1906 Alaska Native Allotment Act and the 1998 Alaska Native Vietnam Veterans Allotment act; and

WHEREAS, a working group of representatives from 150 federally recognized Tribal governments in Alaska, including Sitka Tribe of Alaska, Yakutat Tlingit Tribe, Chilkat Indian Village, Central Council of Tlingit and Haida Indian Tribes of Alaska, Inupiat Community of the Arctic North Slope, Tanana Chiefs Conference, Alaska Realty Consortium, Maniilaq Association, Bristol Bay Native Association, Kawerak, Inc., Alaska Federation of Natives, Alaska Inter-Tribal Council, and Alaska Legal Services Corporation, drafted technical amendments to the Alaska Native Vietnam Veterans Allotment Act; and

WHEREAS, the technical amendments allow the Alaska Native Vietnam Veterans Allotment Act to be amended thereby providing 1) the opportunity for Alaska Natives who honorably served in the military during the Vietnam era to obtain a legislatively approved allotment on vacant federal land in Alaska which would include portions of the Tongass National Forest; and 2) the reopening and legislative approval of all allotment cases closed under the Shield's court decision which required allotment applicants in southeast Alaska to have personally used the land claimed even though all federal land in that region was withdrawn on or before 1909;

NOW THEREFORE BE IT RESOLVED, that the Seventy-Fourth Tribal Assembly of Central Council of Tlingit and Haida Indian Tribes of Alaska convened in Juneau, Alaska on April 15-18, 2009, supports the Sitka Tlingit and Haida Community Council efforts to amend the

Alaska Native Veterans Allotment Act and to reopen the allotments closed under the Shield's decision;

ADOPTED this 18th day of April 2009, by the Seventy-Fourth Tribal Assembly of Central Council of Tlingit and Haida Indian Tribes of Alaska.

CERTIFY

President William E. Martin

ATTEST

Tribal Secretary Michele Metz

May 21, 2009

RECEIVED
MAY 28 2009

Bristol Bay Native Association
Land Management Services
PO Box 310
Dillingham, Alaska 99576-0310

Re: Your letter May 18, 2009 - Veteran's Native Allotments

Dear Mr. Hoseth:

Yes, I do support amendments that would make veterans like me eligible to apply for and receive Native Allotment land that I used customarily and culturally for Subsistence hunting, fishing, and trapping. My family had a cabin on the site I would apply for and I have used that site for over 50 years for Subsistence purposes.

Your questions:

1) Did I apply for an allotment under the current Veteran's Allotment Act and the status?

Answer: I did not apply because the Veteran's Allotment Act did not include my dates of service.

2) I volunteered for the Regular Air Force.
I enlisted on February 20, 1959 and was released from active duty on June 5, 1963. I was a satellite telecommunications crypto specialist. I served in Shemya, Japan, Philippines, Okinawa, Hawaii, Wake Island, Guam, and Midway Island.

I believe that the Veterans of Foreign Wars considers me a Vietnam War Era Veteran.

3) The land that I would apply for, if I am eligible, is located on the East Channel of the Nushagak River. I was raised there for most of my young life and I have used that site as a Subsistence hunting, fishing, and trapping site for over 50 years.

My Dad. Nels Anderson, Sr., applied for the land that I would apply for. His application was lost and he never did get his allotment up there at our camp. He did get an acre of land under another program. I think it was the 14c3 land program (?).

I do support the amendment to the ANVAA program and would urge the Congress to expand the time frame for all Native Veterans so that they can benefit from this legislation.

Thank you,

Nels Anderson, Jr.

Nels Anderson Jr.

cc: Congressman Don Young
Senator Lisa Murkowski
Senator Mark Begich

September 29, 2014

Senator Lisa Murkowski

709 Hart Senate Building

Washington DC 20510

RE:. Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

It was nice meeting you on your recent visit to Haines and thank you for taking the time to listen to us Vietnam Era Alaska Native Veterans about our ongoing problem. It's my hope that you and our Alaska Delegation in Washington draft, **for approval this election year,** a new amendment to the Alaska Native Allotment Act of 1998 which would allow Vietnam Era Alaska Native Veterans inequitably excluded under current law to finally be offered a chance to make Native Allotments selections.

Problem: The existing Alaska Native Vietnam Veteran Allotment Act contains requirements that are impossible for the majority of veterans to meet.

- Lack of Available Land: Land that is available under the Act for veteran allotments is extremely limited or non-existent.
- Limited Military Service Dates: More than 1,500 veterans who served during the Vietnam era are not eligible for an allotment under the Act because they do not meet the military service dates requirement.
- Use and Occupancy Requirements: The requirement that veterans must prove they used and occupied their land under the current definitions will cause many more applications to be rejected. Further, adjudication of the use and occupancy issues will take years and be costly.
-

I took the outline of existing problem that we Alaska Native Vietnam Era Veterans are facing today from a report that was written in 2008, I've attached a copy of that report for your review. The issues that are outlined is this report are still the same issues in 2014!

I am an Alaska Native Veteran that served in Vietnam from May, 1967 through May , 1968, a time served which made me ineligible to apply for a Native Allotment., In fairness to all Alaskan Vietnam Era veterans, I ask that you draft an amendment that would correct this injustice and provide us the opportunity to select land allotments provided to those Natives who were notified and had selected

Native Allotments. I live in a small village where there is a clear separation in the standard of living between the Native Land Allotment Owners and those AK Native Vietnam Veterans without land.

Time is getting short for us Alaska Vietnam Era Native Veterans, I may not be here to see any change but my children will continue the struggle for fairness., If you have any questions please email or call me at (907) 767-5415 or you may contact Desiree Duncan, Tlingit-Haida Central Council Native Lands Manager at (907) 463-7183.

Thank you for your assistance.

Sincerely,

James B Strong

P.O. Box 1234

Haines, AK 99827

jimbstrong@gmail.com

Attachments;

CC: Tlingit-Haida Central Council

Native Lands & Natural resources

STATE OF ALASKA
THE LEGISLATURE

2006

Source
CSHJR 27(MLV)

Legislative Resolve No.
37

Urging the United States Congress to pass legislation amending the Alaska Native Vietnam Veterans Allotment Act to allow deserving veterans to obtain allotments of vacant land within the State of Alaska; and to reopen and legislatively approve allotments in the Tongass National Forest.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS, since 1906, Alaska Natives have had the right to obtain allotments of land under the Alaska Native Allotment Act that was repealed in 1971 by the Alaska Native Claims Settlement Act, but with a saving clause for pending applications; and

WHEREAS, before the 1971 repeal of the Alaska Native Allotment Act, few allotment applications had been filed or approved because most rural Alaska Natives did not learn of the opportunity for an allotment until 1970 when the federal government initiated an effort to inform and assist potential allotment applicants; and

WHEREAS many Alaska Native Vietnam era veterans did not have the opportunity to apply for allotments before the Alaska Native Allotment Act was repealed because they were serving in the military before, during, and after the period when the government

informed Alaska Natives about the opportunity for allotments; and

WHEREAS the United States Congress enacted 43 U.S.C. 1629g, commonly referred to as the Alaska Native Vietnam Veterans Allotment Act, in 1998 to allow certain veterans a chance to apply for allotments, but the numerous restrictions in this Act, restrictions that were not in the Alaska Native Allotment Act, have unfairly disqualified the majority of the applications filed and discouraged many from applying; and

WHEREAS amendments to the Alaska Native Vietnam Veterans Allotment Act that provide a fair opportunity for Alaska Native Vietnam veterans to obtain allotments were previously introduced in the United States Congress to remove many of the obstacles preventing Alaska Native Vietnam veterans from obtaining an allotment; and

WHEREAS basic justice will also be served by the Congress's enacting legislation that will allow approximately 300 allotment cases closed under the federal court decision in Shields v. United States, 698 F.2d 987 (9 Cir., 1983), to be reopened and approved; and

WHEREAS, given that land in Southeast Alaska was withdrawn for the Tongass National Forest by 1909 and that allotment applications are required to "use" land claimed for an allotment before that land was withdrawn has resulted in an unfair distribution of allotments statewide, with few in Southeast Alaska; and

WHEREAS the federal court, in Shields v. United States, decided that the "use" requirement meant the applicant's personal use of the land before it was withdrawn, not use by the applicant's ancestors; and

WHEREAS the Congress did not define the word "use" in the Alaska Native Allotment Act but could do so now by legislation that defines "use" to include ancestral use, which would be applicable to those allotments in Southeast Alaska closed under the decision in Shields v. United States;

BE IT RESOLVED by the Alaska State Legislature that the United States Congress is urged to pass legislation that amends the Alaska Native Vietnam Veterans Allotment Act to allow a fair opportunity for Alaska Native Vietnam veterans to obtain allotments; and be it

FURTHER RESOLVED that the United States Congress is urged to enact legislation that would reopen and legislatively approve allotments in the Tongass National Forest that were closed under the decision in Shields v. United States.

COPIES of this resolution shall be sent to the Honorable Pete Domenici, Chair of the

U.S. Senate Committee on Energy and Natural Resources; the Honorable Richard Pombo, Chair of the U.S. House Committee on Resources; and the Honorable Ted Stevens and the Honorable Lisa Murkowski, U.S. Senators, and the Honorable Don Young, U.S. Representative, members of the Alaska delegation in Congress.

June 22, 2009

Dear Representative Don Young, and Senators Lisa Murkowski & Mark Begich:

I'm writing this letter to ask you to change the Alaska Native Vietnam Veterans Allotment Act Law.

In 2001, on behalf of my deceased brother Andrew Tobuk, I applied for land under the current Act and the application was rejected because his dates of service were incorrect and that he did not die as a direct result of the war.

My brother served in the Army for two years, 1972-73.

Although my brother did not die as a direct result of the war, the heavy drinking that ultimately led to his death was from unresolved grief thinking about a war that was not popular, and Veterans returning home were treated poorly.

The land that I chose for my brother's native allotment is land that he enjoyed going to for subsistence purposes and he always found a great amount of peace going there.

Thank you for your time in this matter and please, do the right thing by the Veteran's and change this law.

Sincerely,

P.O. Box 78
Allakaket, AK 99720

June 26, 2015

Dear Representative Don Young, and Senators Lisa Murkowski & Dan Sullivan:

On behalf of my deceased brother, Arthur John Monroe, I'm writing this letter to beg you to change the Alaska Native Vietnam Veterans Allotment Act Law.

My brother served in the National Guard from 1963 to 1967. It was very important to my brother to serve our country in some way.

On behalf of my brother, our mother applied for land under the original Act and the application was rejected because he did not die as a direct result of the war.

My brother was depressed when he got out of the service. I feel that these men and women deserve to be compensated for the sacrifice that they made for our country.

The land that was applied for in his first application was land that had been used for hunting and fishing and meant a great deal to him. He spent a lot of time there camping and found a lot of peace there.

Please change the law!!

Thank you for your consideration.

Sincerely, Marlys A. Powers

519 Noyes Street
Fairbank's, Alaska
99701

907-456-6862
907-322-0334

To Congressman Don Young, Senator Lisa Murkowski and Senator Dan Sullivan:

My Brother Richard was a good man and gave much for his country. I'm begging that you change the criteria for the Alaskan Native Vietnam Veteran's Allotment Act to include my brother and his decedents because of his missed opportunity to participate in the Alaska Native Claims Settlement Act. I'm asking for this to honor his sacrifice and his memory, because the time he would have spent exercising his rights under ANCSA and perpetuating his heritage for his descendants by surveying an allotment for himself, he instead was serving his country in Vietnam. I am very proud of Richard as he was very proud of his service to his Country. He was a Shareholder for Doyon but was born in the Kobuk Valley.

My brother Richard Gooden served in the United States Navy during the Vietnam War from 1969 to 1973. Before the war I was told that he was a happy go lucky guy, but after he returned his demeanor had changed. He was moody and stressed and could quickly lose his temper. I mostly remember how he was after the war. I've seen pictures of his Vietnam experience and several of them were of him in fatigues with an m-16 and I was told he was in several battles. He became a loner after the war. My Mother told me all he wanted to do was stay in the woods. He didn't talk about his Vietnam experience. His DD214 shows he served on Submarines, both the USS Sailfish and the USS Puffer. He earned several Medals; National Defense Service Medal, Navy Expeditionary Medal, Vietnam Service Medal w/1 Bronze Star, Vietnam Service Medal w/2 Bronze Star.

Since I was very young, 3 to 7 years old, I didn't understand what was happening but for the time I knew him, I remember he was a very reliable, hardworking man who took care of his Parents, Brothers and Sisters. He died when I was 14, in the spring of 1981.

Before and after the war Richard hunted around Anderson Alaska, I think near the Rex trail but I'm not sure, but definitely around Anderson. He talked about his hunts but I was too young to remember much about them. My parents had a better idea about where he hunted but my father passed away in 2006 and my mother passed away in 2008. My brother would also have been a source of information but he passed away in 2010.

Thank You,

Patrick Huff

4205 York Ave

Fairbanks, Ak 99709

907-378-6614

Feb. 12, 2009

Hon. U.S. Representative Don Young

I am writing to you to ask that you amend the Alaska Native Veterans Allotment Act of 1998.

My name is Nicholas Monroe. I was born in Nenana. I am an Alaskan native, as well as a Viet Nam veteran having served in the U.S. Navy from Oct. 1969, and was honorably discharged in Oct. 1973. During this time the Native allotment process for filing was going on, and me being gone serving my country, I did not have a chance to file on any parcel of land. When it did come up for filing there was no land around Nenana to file for, so I did file on land, and it was rejected. The land I applied for is very important to me and my family not only for subsistence, as well as a way to teach my children, and if they choose, to teach their children the way that I was taught about the land and how to respect it. Having three kids and a wife I would like to have the opportunity to successfully file on a parcel of land; as my Mom, Dad, and Grandmother were all born here in Alaska. I would like to be able to pass on to my family a part of Alaskan history, as well as land for them to own. I urge you to amend the Alaska Native Veterans Allotment Act for me to pass on the Alaskan heritage that I was born into, and leave them a piece of Alaska for their own; as time is getting critical at this point.

Sincerely,

Nick Monroe

Nick Monroe

Vet. 1969-73

May 27, 2009

Dear U.S. Senator Lisa Murkowski

I am writing to ask you to amend the Alaska Native Vietnam Veterans Allotment Act of 1998. My name is Theodore D. Suckling. I was born in Tanana, Alaska. I am an Alaskan Native as well as a Vietnam Veteran. I served in the U.S. Air Force From Oct. 1969 to Oct 1973, and was Honorably discharged after serving my country for four years. I was away when the filing process was going on and did not have a opportunity to file on a parcel of land that I would have been able to apply for. After having a chance to file on land later there was no land close to Nenana, where I grew up, to file on, and filed on other land that I thought was available, but was rejected. Being an only son, I would like to be able to file on land that I can pass on to my family, to keep a part of Alaska in our family, and pass on for generations. I Have a commercial fishing license, and having an Native Allotment would be an important way to keep Part of Alaska, and my Heritage alive for future generations of my family to utilize, and call it a part of their own. Time is getting critical as months go by, and I urge you again to please amend the Alaska Native Veterans Act of 1998.

Sincerely,

Theodore D. Suckling

Theodore D. Suckling
Veteran 1969-73

May 27, 2009

Dear Representative Don Young, and Senators Lisa Murkowski and Mark Begich:

I am writing to you today to ask you to please amend the Alaska Native Veteran Allotment Act of 1998.

My name is Harold Semaken, I was born in the Tanana Hospital in 1944, raised in Kaltag, Alaska. In 1963 I joined the Alaska Army Reserve National Guard while I was still in High School. I graduated from St. Marys High School in May 1964 and started my basic training in June of 1964. I was stationed at Fort Ord in Monterey, California from June 10, 1964 through December 23, 1964. That was over 180 days of Active Duty. That made me eligible as a Vietnam era Veteran honorably discharged. From then, I served dutifully out of Anchorage on Camp Carroll until 1970. In 1977 I rejoined the ARNG with the Headquarters out of Nome, Alaska and served from Galena until I was Honorably discharged in 1992. All in all, I served 17 years in the Army Reserve National Guard of Alaska.

I applied under the current Veterans Allotment Act and am still waiting to hear on that.

In 1971 the Alaska Native Land Claims Settlement Act was passed and because I was not at home in my home village of Kaltag, I missed out on the opportunity that the villagers had in claiming land. At that time there were no jobs in Kaltag, so I had to move to Anchorage to find work to raise my family. I was never paid high enough to make a career serving in the ARNG so I had to seek other opportunities outside of the ARNG to find higher pay in order to raise my family of 8. It was very difficult to leave my home in Kaltag, my family, my Native foods, and land to serve the United States Alaska Army Reserve National Guard. I missed out on the opportunity to acquire land and therefore couldn't raise my family in the subsistence lifestyle that I wanted to.

At this time I am living in Anchorage and am still working at my age.

I would like to take some time and tell you that my father, Benjamin Semaken served in the Territorial Guard. He was born on April 21, 1919 and died in Galena, Alaska on December 24, 1965. I know that myself and my brother, Philip Semaken, are entitled to his benefits, but we have not received them. I am still trying to pursue this, I need my father's death certificate.

I appreciate the time you have taken to read my letter. Please look into this very important matter as it affects my whole family's future. I hope that my children and grandchildren and so fourth will be able to live on the land that should rightfully be mine.

Feel free to call me if you have any questions or need more information.

Sincerely,

Harold J. Semaken
P.O. BOX 143045
Anchorage, Alaska 99514
Cell Phone: 907-322-1710
Home Phone: 907-868-7706

November 16, 2007

Chairman Nick Rahall
Committee on Natural Resources
United States House of Representatives

Re: H.R. 3350 Alaska Native Veterans Land Allotment Equity Act

Dear Chairman Rahall and the Honorable Members of the U.S. House Natural Resources Committee,

I write in support of H.R. 3350, the Alaska Native Veterans Land Allotment Equity Act. I am an Alaska Native, and a United States Veteran who served this country in the Vietnam War. I have received 100% disability from the Veterans Administration based on the injuries I received during the War. I applied for land under the 1999 Act, but was denied because my dates of service did not coincide with the original dates, and that the land I applied for was part of the Tongass National Forest. I thus strongly urge Congress to adopt H.R. 3350 so I can get a native allotment of my own.

During the most critical application period for Native Allotments (the years leading up to the passage of ANCSA in 1971), I was serving our country, and was thus not able to apply for an allotment. By reopening the application period, Congress would provide me with an opportunity to receive a native allotment.

Under H.R. 3350, I will be able to receive the land where I have fished, hunted, collected berries and lived in Southeast Alaska. I thus urge you to adopt H.R. 3350 because it will allow me to own land that I can call my own.

Sincerely,

Michael Littlefield

Michael Littlefield
Vietnam Veteran
Alaska Native

Cc: Senator Stevens, Senator Murkowski

Dear Representative Don Young, and Senators Lisa Murkowski and Mark Begich,

To whom this May Concern,

I, Percy Hunter, Jr served in the Military 1 yr, 7 mos, & 3 days. I was in Vietnam for 13 mos (1968-69), Tet Offensive. I served in Bien Hoa, Long Bien, Di An, Da Nang, Phu Bi and Hoa.

I was Drafted in 1967 and at that time I was the Primary Bread winner for my family. The family consisted of 3 sisters & 1 brother.
I experienced Difficulties ajusting to military life and when it was over, readjusting into Civilian life, was just as Difficult.
I had hardships when I returned to the United States and I think it would be nice if we Veterans who served in Vietnam got the land that we Deserve.

Sincerely,
Percy Hunter Jr.

Teresa Gaudette
Realty/Enviornmental Specialist
Organized Village of Kake
P.O Box 316
Kake, AK. 99830

March 4, 2009

Dear Teresa Gaudette,

Thank you for informing me of the Alaska Native Veterans Land Allotment Equity Act. I never heard of this program until about four years ago. When I did try to apply I was told that I had missed the dead line.

A little history of my family: I feel I would have to explain this to get my point across. My father served in World War II, Korean War and was on red alert for the Vietnam War while stationed at Fort Lewis. He served with the military for twenty-four years. My mother served during the Korean War for four years. This is why I felt obligated to serve my three years.

I joined the military January 15, 1976 although I never went to Vietnam I did spend sixteen months in Korea. I was honorably discharged from Oakland, California , January 15, 1979. Although I missed the dead line for applying for the Alaska Native Allotment, I feel that because of my time and my parents time in the military all this should add up to something. Either way I fully support the effort of Rep. Don Young last year and this year, Sen. Mark Begich and our local group for trying to get allotments for our Native Veterans that served their country proudly during the Vietnam era. And I have to add that per capita Kake, Alaska has a very good record of young men and women who have served their country.

If I did receive an Alaska Native Veterans Land Allotment this would not only benefit me but also my whole family that would include my children, my brothers and sisters children to. And I also have to add that Alaska Native Veterans not being able to get their lots in the Tongass National Forest and the Glacier Bay National Forest is totally unfair. This land belonged to our ancestors long before the land became Tongass National Forest or Glacier Bay National Forest.

Sincerely,

Robert D. Mills
Kake Alaska Native Veteran

May 27, 2009

To Representative Don Young, Senators
Lisa Murkowski & Mark Begich:

I- David A. Bran am writing you to ask you to change the "Alaska Native Vietnam Veterans allotment Act" Law

I applied before and was denied a claim.

I spent two years in Vietnam and now as a result of 100% Service Connected Disability ask you to please change this "law".

An allotment of land means I can belong to a heritage that is too soon to be lost, I have five brothers & two sisters who have no allotment at all, we need to keep our heritage strong and alive for the future of "Native Land & People".

Respectfully yours,

David A. Bran
5674 Mirror Lake Drive
West Jordan, UTAH
84081

Tel.: 801-260-1786

Dear Representative Don Young, and Senators Lisa Murkowski, and Mark Begich:

I am writing to ask you to please change the Alaska Vietnam Veterans Allotment Act law. I received a letter from the Department of the Interior dated 6 September 2002. This was a letter rejecting my Veteran Native Allotment Number AA-83550. The reason given was the land I applied for was no longer in the possession of the Federal government. I had not previously been aware that this land was not in fact owned by the Federal government.

My military service began in the fall of 1969 after graduating from Ketchikan high school. The draft lottery was still in effect at the time and when the results were published I found myself with a very low number and a very strong chance of having to report to the US Army in the immediate future. With this in mind a friend and I signed up with the US Navy where we figured we had a much less chance of being caught up in the violence associated with war. I ended up spending a couple of tours just off Viet Nam as an electronic technician on the aircraft carrier USS Ranger.

My mother was a victim of the cultural transformation from her being raised on a complete subsistence lifestyle on the tundra near Noatak to living in the city with all the modern conveniences. With such a drastic change in diet and physical exercise she found herself ravaged by high blood pressure, hardening of the arteries, diabetes, and severe arthritis which confined her to a wheel chair for several of her last years.

I had an older brother and sister both of whom had long since left home. For the last ten years of my mother's life she and I became very close. My leaving for Viet Nam was extremely hard on her, as I took care of her much of the time. My father, an Inupiaq man from on the Fish River near Nome, worked on the State Ferry System and was away more than half the time. He also was an alcoholic who when in his worst states of mind took out his frustrations on my mother. Every day that I wasn't home for my mother seemed an eternity to me. I believe my father was a gentleman but who also went through some extreme changes in his lifestyle and to cope he turned to alcohol.

My mother passed away a few days after my 21st birthday. I was on duty onboard ship in California when the Red Cross sent a telegram requesting my presence at my mother's side. The Executive Officer of my ship received the telegram but falsely reported my being on leave. A shipmate by chance saw the telegram and informed me. I got to Seattle a day late and heard my mother had been calling for me all the last night of her life.

Several times while I was in the Navy my mother mentioned the Native allotment program but by the time I was discharged from the Navy the filing deadline had passed. I feel that my mother and father (also deceased) would be very proud that I would someday have some land in Alaska to pass on to my children. I know my parents wanted to stay in Northwestern Alaska as it was their home. They both moved to Anchorage and on to Ketchikan following money and jobs that went with the assimilation into western society.

While growing up in Nome our family did all the activities that went along with our subsistence lifestyle. As we moved further south we were more integrated to the city life. We still hunted, fished, picked berries, leaves and roots and also helped organize Cook Inlet Native Association. Ketchikan brought us even further away from our Inuit roots. My mother made friends with the local Indians who made us not feel quite so isolated.

When my mother died I moved to Anchorage and helped build the Alaskan Pipeline as a teamster. I went to college and got a degree in instrumentation for the petroleum field. This got me a job with Unocal on the Kenai Peninsula. My wife and four kids that we raised over the last twenty five years have done our best to keep up with our ties to our Eskimo culture. Family and friends live in Nome and Kotzebue who we visit regularly. I would very much like to have a piece of Alaska to enjoy and to one day pass on to my grown children.

James Gray
PO Box 1286
Kenai, Alaska 99611

James Gray

May 25, 2007

John Rhellson
PO Box 63
Perryville Alaska 99648-0063

RECEIVED
MAY 29 2009

BBNA
Land Management Services
PO Box 310
Dillingham, Alaska 99576-0310

Subject: Alaska Native Vietnam
Veterans allotments

Dear Sir or Madam:
I would like to show my support for an amendment to PL 105-276 which would make lands available to Vietnam Veterans who never had a chance to apply because of active service during time of application period or for any other reason.

I did my tour of duty in Vietnam on board the U.S.S. Ingersoll - DD652 from March of 1968 to December of 1969, and I should say joined the Navy in March of 1968 and after completing boot camp was assigned to the above destroyer which served in Vietnam.

Started out to apply for lands that had been made available when this first came about but never furnished the process because one of the criteria was to have had something on the land to show it had been occupied and really couldn't show that because I had been in the service.

Having land made available would help me to have a subsistence site that I can go to whenever I wish and possibly put up a small cabin to stay in.

Sincerely,
John Rhellson

NOV 19 2007

14 NOVEMBER 2007
BOX 469
PILOT POINT, AK. 99649

BRISTOL BAY NATIVE ASSOCIATION
LAND MANAGEMENT SERVICES
P.O. BOX 310
DILLINGHAM, AK. 99576
ATTN: SHEICA NEKETA

WHEN I WAS A TEENAGER IN 1965 MY COUNTRY WAS IN TROUBLE AT A FAR AWAY PLACE CALLED, VIET NAM; MY COUNTRY NEEDED THE PHYSICAL FIT AND YOUNG IN IT'S ARMED FORCES, I WAS ONE OF THEM. I DID NOT WAIT FOR MY COUNTRY TO ASK ME TO COME, I ENLISTED AND OFFERED MY SERVICE FOR THE UNITED STATES OF AMERICA, I GAVE MY VERY BEST. FORTY-TWO YEARS LATER I AM MUCH OLDER, IN MY SIXTIES. I ASK MY COUNTRY TO GRANT A SMALL PORTION OF LAND TO ME THAT MY PARENTS (MYSELF INCLUDED) AND THEIR ANCESTORS USED FOR SUBSISTENCE PURPOSES; I.E., FOOD GATHERING, FISH RACKS FOR DRYING FISH FOR OUR DOGS AND FOR OURSELVES, TRAPPING, CARIBOU, MOOSE HUNTING AND GATHERING SEA BIRD EGGS IN THE SPRING. THIS IS HOW IMPORTANT AND HOW CONNECTED I AM TO THIS LAND I APPLY TO FOR MY NATIVE VIET NAM ALLOTMENT IS.

ENCLOSED IS TWO LETTERS OF TESTIMONY HOW MY PARENTS AND MYSELF USED THIS LAND.

Nick Neketa
NICK NEKETA

Dear Representative Don young, and senators
Lisa Murkowski, Mark Begich:

I'am writing to ask you to change the
ALASKA native Vietnam Veterans Allotment
Act law. I applied ~~and~~ under current
Veterans Allotment Act and my Application
status is pended. I'm Vietnam era
1974 to 1977. discharge under honorable con
With full Benifit. ~~These~~ I was on Alert
for 3 Time to go in Action. for ~~three~~ almost
3 years I was in 82 Airborn Dirision ~~Field~~
almost every day I drank beers, before I
join I didn't drink That much. IS Allotment
will be good for step child AND Their kids.

Thank you for yours
Coopration
Coopreration
Aebert Frank
P.O. Box 57
Venetie, ALASKA
99781

Roger M. Jones
77996 Brock Road
Oakridge, OR 97463

May 29, 2008

Representative Don Young
2111 Rayburn HOB
Washington, DC 20515

Senator Lisa Murkowski
709 Hart Senate Building
Washington, DC 20510

Senator Mark Begich
825C Hart Senator Building
Washington DC, 20510

Dear Representative Don Young, and Senators Lisa Murkowski, and Mark Begich:

I am writing to strongly urge you to change the Native Vietnam Veterans Allotment Act Law. Although I applied under the current Veterans Allotment Act on February 4th 2002, my application was subsequently rejected in 2003. The letter outlining the outcome of my application cited that the dates that I served my country did not fall into the proper category for approval.

In October 1965, I was drafted into the navy. I made rank of E3 and served my duties as a mechanic working on heavy equipment. I served until September of 1967, when I was honorably discharged. Although I would never have refused to serve my country in a time of war, I shall never forget not being able to attend my first child's birth. This of course is no comparison to the hardships that many of my fellow brothers and sisters in arms were forced to deal with.

Receiving an allotment is extremely important to me for a variety of reasons. I have owned and operated a logging company for several decades. I am currently retired and still a member of the 13th region. In short, I have served my country in time of war, raised and provided for a family of four, and supplied employment for hundreds of people over the years.

In spite of my best and most noble efforts to serve and maintain a good quality of life for my community and family, I have lived long enough to see the American Native Claims Settlement Act (ANCSA) of 1971 end in tragic disappointment. To the best of my knowledge, most of the tribal corporations have been forced into bankruptcy and their timber holdings are exhausted. It is my position that to be denied an opportunity to

receive consideration for an allotment of land that may be rightfully due me, will constitute another social injustice like that of the plight of ANCSA.

I am not purporting that the United States congress owes me anything. Rather, I am suggesting, that I myself owe it to the future generations of my Alaskan heritage, to follow through with any and all efforts to secure what resources that may assist those generations to afford them a higher quality of life.

Sincerely,

Roger M. Jones
1-541-782-3261
Retired Veteran

Representative: Don Young

June 5, 2009

Dear Don Young,

We are asking to change the Alaska Native Vietnam Veterans Allotment Act of 1998.

Benny Allen Andrews, our brother, born November 6, 1950 and died on October 17, 1998, an Alaskan native. He served in the U.S. Army on November 12, 1970 until November 23, 1973, who honorably served our country during the Vietnam War. He received an honorable discharged from the U.S. Army. We are writing this letter begging you to amend the Alaska Native Veteran's Allotment Act of 1998.
Benny applied under the current Alaska Native Veterans Allotment Act of 1998 but under the current Act he didn't have the opportunity to fulfill his plans. We think it is very important to him, like any U.S. citizen he wanted a piece of that opportunity but did not get it because of the current law.
Benny served our country honorably with his close friend, Nick Snow. Although Benny did not die from direct results of the war but he had some hardships after the war which became obvious. He got a divorce from his wife, who had a child. His addiction to alcohol eventually took his life. On behalf of our brother and many more veterans who served in the so called unpopular Vietnam War. We the under signed are asking and even begging you to amend the Alaska Native Veteran Allotment of 1998 and give those who have served our country to get what he deserved and promised, but not received.
At the end of his life, his addition to alcohol eventually took his life. One can only imagine what tragic incidents he incurred in Vietnam. Benny didn't seek or receive the help

he needed from the VA to help him cope as he should have. Our feelings are that some veterans feel they have to be wounded physically to receive help but the inner injuries can sometimes burden one beyond physical injury. Yes, he lost his wife and child and lived a life where there was no help to visit a VA medical facility and it wasn't available to the veterans.

If you have any questions, please contact me at (907) 337-6148 home or cell phone number (907) 764-7360 or my sister, Marcia C. Whitworth at (907)262-8802 home or cell phone number (907)229-2488.

Sincerely,

John B Andrews.

Marcia B Whitworth, sister

Roqueen Andrews, sister

John B. Andrews Jr.
Personal Representative for Benny Andrews
3216 Peterkin Avenue
Anchorage, Alaska 99508

Copy furnished to:

Senator: Lisa Murkowski
address

Mark Begich
address

5-2-08

Dear Representative Don Young, ~~Lisa~~ senators, Lisa Murkowski, and Mark Begich:

I am writing this letter to change the Alaska Native Vietnam Veterans Allotment Act Law. Also in this letter I will try to explain why it is important to do so. And to include all Alaskans that served in the military but was oversea's during the Alaska Native land Claims Act. Although there was an another chance for them to apply for land under the Alaska Native veteran Allotment Act of 1998, some of them are no longer with us. Even before this Act of 1998 many of them from our Villages had already died of different reasons. I would also like to point out that during the time of the vietnam era there was little understanding of the importance of the A.N.L.C.A. Many people, not just veterans did not know they had to fill out paper work to select lands that was traditionally theirs by Native culture. The lands that they were denied are lands that belonged to the families from which they came from and the area's that were traditionlly where the families resided in. on a more personal note I did apply on behalf of my late brother Dan but encountered a flaw in the 1998 Act that gave these veterans a second chance to select lands. We were denied land selection because we were told that he would to have died due to a wound of war. Although he died of suicide after being home for about 5 years, like many other veterans of Vietnam. They were going through what we now know as post traumatic stress, and then as well as we know

little about at the time. I well let you Judge for yourself the following example of this wound, and what lead to his death. when my brother first returned home from his first tour of Vietnam he was no longer the same person that left a year earlier. He was angry at the world and could not get along with many of his friends, which made him a loner in our village. To escape this inner turmoil he would either drink or go to our homestead on the Koyukuk river to hunt or trap. At our cabin is where he found some peace within himself, for month's on end he would stay at our cabin a lone. He faced many hardships at that time, not because he did not know how to live in the woods. But because he could no longer Kill anything, for that reason alone to survive in the outdoors spells doom for an outdoorsman

After making a little money trapping he would come back to the village and he did what many of the veterns did, he drank up all his money and got in trouble with the law. With this cycle of abuse many of our veterns commited suicide leaving behind their families and loved ones. Along with my brother there were many veterns that were left out of the land claims, which meant they left nothing for their families and children. To this day we are still trying to aquire land on behalf of these veterns with little sucess. To make a long story short they served their country faithfully and to protect it citizens against its enemies. It just seems that

Cont.

it would not be asking the U.S. government much to grant their veterns a small piece of land for serving their country. It is my personal hope that someday I will be able to tell my grandchildren that the land we are sitting on once belonged to their great uncle. In closing I would like to ask you to right a terrible wrong done to these american vetern and give them what is rightfully theirs

Wayne Huntington

P.S. - Post traumatic stress should be considered a wound of war because that is exactly what it is.

May 22, 2009

Dear Representative Don Young, and Senators Lisa Murkowski & Mark Begich:

I'm writing this letter to ask you to change the Alaska Native Vietnam Veterans Allotment Act Law.

In 2001, my family, on behalf of my deceased brother Andrew Williams, applied for land under the current Act and the application was rejected because the land was unavailable. There was so little to choose from to begin with!

My brother served in the Marines for four years, starting in 1969 to 1971, and then the Reserve until 1975.

When he returned home he didn't talk about the hardships or difficulties that we knew he had faced. His only concern was that he wanted to have some land of his own through the Native Allotment Act. He was very disappointed to find that filing was closed by the time he returned home.

It is very important that I follow through with his mission. It would have meant so much to my brother, knowing that his dream has a chance of coming true. Changing this law would mean so much to so many Veteran's.

Thank you for taking the time out of your busy schedules to read this important letter on behalf of my brother who so proudly served his country. You must do the right thing now and change this law.

Sincerely,

Norma J. Williams

May 13, 2009

Dear Representative Don Young, and Senators Lisa Murkowski & Mark Begich:

I'm writing this letter to beg you to change the Alaska Native Vietnam Veterans Allotment Act Law.

I applied for land under the current Act and both of my parcels were rejected because the land that I chose was not available. There was so little to choose from to begin with!

I was drafted into the military in 1969 and served from 1969-1971. I was stationed at LZ Hawk Hill, not far from Da Nang. Before I was drafted I lived pretty much a subsistence lifestyle. Suddenly I was moved to another world, fighting a war that I really didn't understand.

It was an unpopular war and once we returned people looked down on us. You hear stories about people spitting on returning soldiers. Those types of stories are true! Once I returned home I became a very heavy drinker. I also learned how to smoke marijuana while in Vietnam so upon my return I was heavily addicted to both drinking and smoking marijuana. It was difficult at best to deal with returning from a war that I never understood to begin with, with people hating me for fighting it, and to try to come back to a lifestyle I no longer knew.

After some time I knew I needed to do something to change what was going on so I moved out into the woods and stayed out there for a long time so I could find myself again.

It will be like therapy for me to have some land to build on and live on. After serving our country as I and so many people did, I deserve that chance.

Thank you for your consideration.

Sincerely,

Franklin R. Silas

May 13, 2009

To: Representative Don Young
Senator Lisa Murkowski
Senator Mark Begich

RECEIVED
MAY 18 2009
ALASKA LEGAL SERVICES CORPORATION

From: George H. Koonaloak
PO Box 239
Point Hope, Alaska 99766

Dear Sir or Madam:

I am writing to ask you to change the Alaska Native Veterans Land Allotment Equity Act. I served in the Marine Corp from 1973-1976 and received an a Honorable Discharge. Several years ago I had applied for Veteran Native Allotment and I haven't heard from them ever since. Even though my mother had medical issues, I went and serve for our country during that time frame 1973-1976. I have worked all my life, almost retiring from work; I was lucky that I worked all these year after serving US military. I am a proud American even though it is hard being a minority but still I have endured all these years, I like to leave something for our children & grandchildren. If I qualify for this allotment and the law changes, maybe a lot of Veterans all over will finally get what has been due for a long time. God Bless You All, thanks for giving me a chance to voice my on-going concern regarding this issue.

George H. Koonaloak

Sincerely, George H. Koonaloak

Lead Power Plant Operator
North Slope Borough
Point Hope, Alaska 99766

Phone #: 907-368-2924

Cc: file

Native Village of Point Hope, Realty Department, P.O. Box 109, Point hope, AK 99766

Alaska Legal Services Corp., 1016 W. 6th Ave., #200, Anchorage, AK 99501-1963; Attn: Carol Yeatman

May 21, 2009

Honorable Senator Lisa Murkowski,

I am writing in support of a proposed amendment to the Veterans Allotment Act, with the understanding allotment based land would be available to Alaskan Vietnam Veterans who served between 1964 through 1975.

Allotment application listed for Valerie J. Dewey is filed under the current Veterans Allotment Act. Declination notice was issued and received indicating tour of duty served (January 1973 to January 1976) as the basis for non-eligibility.

As a first generation Alaska Native, Athabascan decent, and a Vietnam medic who received an honorable discharge, I welcome the opportunity to apply for ownership of an allotment under new provisions granting Vietnam Vets who dedicated their lives at war beyond the original application filing deadline of 1971.

During the Viet Nam War I rose to the rank of E-5 Sergeant serving our country for 3 years while stationed in Frankfurt Germany. I worked in the 97th general hospital there. My brother was stationed at the DMZ- Zone during the Viet-Nam War. Two family members of the same family could not be in a War zone at the same time due to the Military laws and regulations.

After I returned home from the Vietnam War, I experienced difficulty in securing employment, and acquiring more college education due to postwar discovery of learning disabilities.

The rustic environment of Alaska brings higher fuel costs, enormous cost of living challenges. Since the Viet Nam War; my mean wages have not kept up with overall living expenses'. The allotment would means a tremendous amount to me; as it would give me a place to retreat, a place where family reunions could occur, a traditional area to conduct subsistence activity's, and traditional berry picking, with camping, and it would help me support and continue my cultural family heritage.

Please accept my letter of support, and feel free to contact me for future comments.

Sincerely,

Valerie J. Dewey

Valerie J Dewey
P O Box 72757
Fairbanks Alaska
907-458-7281 Home
Cell 907-322-1316

MAY 12th.2009

Dear Representative Don Young/Senators Lisa Murkowski
and Mark Begich;
I am writing to ask you to change the Alaska Native Vietnam
Veterans Allotment Act Law.
I believe I applied but was rejected.My years in Vietnam was
From 1967 April to 1969 April.My life in Vietnam was I, really
didn't give a @#&* . All I did was what I was told to do by my
country. I was proud of my country but not the way I was treated
when I got home, by my people and country. I got 9 medals in my
bedroom,1, a silver star.I think sooooo what. I didn't have a
house
to call my own. Now I do have a house on my mothers' land.
Is it so wrong to ask for a little land? I believe we deserve it.
My life after I got back was something else. This is a true state-
ment.I had no home was packing my sleeping bag and clothes
from house to house.I did this until 2000, I'm 65 now and I left
Vietnam in 1969 April .You calculate the years I did this.If I get my
own
allotment I would finally ,feel free.Even at this age I think it
would
help me heal. of the biggest lose is not having a wife/kids .I had
nothing to offer.But I now have a partner who stays with me and
she
had 4 children from her first husband.I know they all love me but
I cannot show them I love them too.I lost that in Vietnam.
I lost how to love.physically/emotionally.
Yours truly,

Sherman S. Thomas
My company is
A. Company 21 Inf. 11 Brigade

May 13, 2009

Senator Lisa Murkowski
709 Hart Senate Building
Washington, DC 20510

Re: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Lisa Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am Vietnam Veteran and I applied for a Native Veteran allotment and it was rejected. The reason it was rejected is because it is located in the Tongass National Forest. All Southeast Alaska Native Veteran allotment applications were rejected because of the Forest. This is unfair to the Vietnam Veterans of Southeast Alaska.

I served in Korea as a MOS III, February 13, 1963 to February 15, 1963. I also served January 10, 1969 to January 10, 1975 in Vietnam as a heavy equipment specialist. Having a Native allotment will create independence for my family and something that I can pass on to my children and grandchildren.

Thank you for your assistance. If you have any questions, please feel free to call me at (907) 209-5211 or you may contact Desiree Duncan, Central Council Native Lands Manager, at (907) 463-7183 or dduncan@ccthita.org.

Sincerely,

Jake E. Morris
Alaska Native Veteran

May 18, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in U.S. Army active duty and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-209-8100 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

Alfred McKinley, Sr.
P.O. Box 21713
Juneau, Alaska 99802

May 25, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in Vietnam - Marine's - E-Rank and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 586-0149 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email ddunean@ccthita.org.

Sincerely,

Frank C. Ortiz Sr.
Box 102
Juneau, AK
99801

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in VIET NAM 1965 and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-945-3133 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

Anthony Gilbert Willis
BOX: 281
HOONAH, AK. 99829

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in U.S. Army Airborne and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-321-1824 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

George W Mills
P.O. Box 286
Hoonah, AK 99829

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in Army and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-945-3110 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

PO Box 435
Hoonah AK 99829

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in Vietnam and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at (907) 945-3202 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

Donald L. Bell Sr.

Juneau, AK

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in U.S. NAVY Vietnam Veteran and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-945-3634 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

Everett J. Homer
PO Box 522
Hoonah, AK 99829

May 24, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in A.N.G. and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907 209 1470 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email ddunean@ccthita.org.

Sincerely,

Ray Henry
Box 607
Hoonah, AK. 99829

May 14, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in ARMY VIETNAM and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907 945 8204 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

[signature]
POB 576
Teonah Ak
99829

May 22, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in U.S. Navy 1970-1972 and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at 907-790-3702 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email ddungan@ccthita.org.

Sincerely,

9347 Riverbank Way
Juneau, AK 99801

May 20, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in Marine's and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at _____ or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

Box 106
Juneau, Ak. 99801

May 20, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for the Native Veteran Allotment being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in Vietnam - 101st Abn 67-68 and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and will create independence for families that can be passed on to future generations therefore I am in full support of this and urge the U.S. Congressional delegation to take a stance on behalf of this amendment being re-introduced.

Thank you for your assistance in this matter. You are welcome to call me at (907) 523-0229 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. This is the same address of the Southeast Alaska Native Veterans. Email dduncan@ccthita.org.

Sincerely,

James M. Lindoff Jr.
Box 31995
Juneau, Ak. 99802

May 19, 2009

Senator Lisa Murkowski
United States Senate
709 Hart Senate Building
Washington, D.C. 20510

RE: Amendment to the Alaska Native Veteran Allotment Act of 1998

Dear Senator Murkowski,

I am requesting the Alaska delegation submit an amendment to the Alaska Native Veteran Allotment Act of 1998. I am a Veteran and am in support for *Amendment to the Native Veteran Allotment Act of 1998* being re-introduced. The rejection of the previously submitted applications for Vietnam Veterans reasoning was unfair.

I served in the United State Navy and am currently a member of the Southeast Alaska Native Veteran's Office that is located here in Juneau. We have an active group and one of the continuing agenda items that are addressed at our regular monthly meetings is the Southeast Alaska Native Veterans Allotment. This allotment is extremely important to those affected and if adopted will create independence for families that can be passed on to future generations. I am in full support of this and urge the U.S. Congressional delegation to move forward with this legislation.

Thank you for your assistance in this matter. You are welcome to call me at 907-723-1656 or by contacting Desiree Duncan, Manager Native Lands & Resources, Central Council of Tlingit and Haida Indian Tribes of Alaska, 320 West Willoughby Avenue, Suite 300, Juneau, Alaska 99801. Email dduncan@ccthita.org. Please make note that this is the same address of the Southeast Alaska Native Veterans.

Sincerely,

Darrell T Brown

Darrell T. Brown
Viet Nam Vet USN

Lawrence D. Sifsof
PO Box 1250
Dillingham, AK 99576

November 20, 2007

Subject: HR 3350 Alaska Natives Veteran Land Equity Act

To Whom It May Concern:

My name is Lawrence Sifsof. I am an Alaska Native Veteran. When I came home from Vietnam in June of 1970 I was completely in the dark about the Native allotment act. My enlistment date in the army was November 14, 1967 and discharged on June 15, 1969. According to Bureau of Land Management (BLM) I missed the service dates by one month. I came from a little village as many of the Alaska Native Veterans do. There was barely a radio, no television, and no newspapers. The Native people of Alaska were very much in the dark about the Native allotment act.

I don't like to repeat myself but this is very important. When most of us went into the armed forces it was very hard to be literally dragged from a little village in Alaska to a war we never even heard of. We were very young but in our village where we grew up there was chores that must be done in order to survive. During the summer I fished both for subsistence and commercially. I used the land for which I applied to fish in the summer, hunt geese in the spring and ducks in the fall. I was using this land since I was about eight years old, I used to go by myself, I used the trees for fuel to keep warm and to heat feed for the dogs during the winter as that was our form of transportation. I used the rivers to travel and to get food to put on the table, like moose, caribou, ect. In closing I would like to say I and my fellow Alaska Natives would like a chance to pick some land that is left for the rest of the Native Veteran allotment applicants of Alaska.

Sincerely,

Lawrence Sifsof

Lawrence Sifsof

May 28, 2009

Representative Don Young
Senator Lisa Murkowski
Senator Mark Begich

I am writing on behalf on my late husband, Jake A. Aloysius Jr., to ask you to change the Alaska Native Vietnam Veterans Allotment Act law. At the time of his death, he had been submitting paperwork for his native allotment.

I have papers, documents, and highlighted maps showing parcels he would be eligible for. After his death in 2005 a letter came saying he was ineligible. Why?!

Jake A. Aloysius Jr. was honorably discharged Aug 30, 1965 – Reserves to August 27, 1969.

In this period of time Jake was not home to apply for his Native Allotment although all his growing up years were spent subsistence hunting and fishing the lands and rivers of Holy Cross, Alaska and Piamute. Jake sent all his military pay to his mother and father in Holy Cross so as to help support the Aloysius family.

Jake was proud of his heritage. Ready to fight proudly, not only for his country, but also for the Native Allotment he felt was due to him, being as he was deprived of the chance to apply for it himself.

Our native people who served in the military deserve this Native Allotment as this land is their pride, their heritage, and their responsibility.

God Bless You

Aimee L Aloysius

Mrs. Jake A. Aloysius Jr.

Testimony of John J. Trautner
Girdwood, Alaska
To
United States Senate Committee on Energy and Natural Resources
(April 25, 2013) July 26, 2013

Chairman Wyden, Senator Murkowski and distinguished senators.

My name is John J. Trautner. I am a veteran of the Korean Conflict and have been a resident of Alaska since 1958. I offer my testimony in support of Senator Murkowski's bill, S. 366. This enables mistakes related to mining claims to be corrected—for me now and for others in the future. I appreciate Senator Murkowski's work over five or six years now to bring the merits of my situation forward and to press for a solution that is fair and equitable for everyone in the future.

My situation comes down to a honest mistake, a glitch in the BLM recording paperwork that I dropped off at their office to comply with the federal mining law (after the claims had been properly worked by others and myself since 1973 and after they were ready for patenting in 1994). Actually there are two honest mistakes by BLM, one in not recording the paperwork (annual labor affidavit under the small miner exemption) and the other in failing to apply *overpayments* of claim maintenance fees that were made in previous years. Had that been done, an Act of Congress would not be required to solve this problem. Unfortunately, we are where we are.

Here is the relevant history. Beginning in 1983 and through 1994, I accumulated and worked and properly filed paperwork to hold (and then patent) the following Placer Mining Claims: AA023149, AA023163, AA 047913, AA047914, AA047915, AA047916, AA017917, AA047918, AA047919. These claims are depicted on Mineral Survey MS-02517, attached, and are the subject of Mineral Patent Application AA-072648, which I filed on August 12, 1994. (Relevant portions of that application are also attached.) The claims are contiguous and total approximately 180 acres and were located on February, 23, 1982.

I am a small suction dredge miner who held title to these claims in the Chugach National Forest in Alaska for 22 years. On April 1, 1990, I applied for permission to BLM and had the claims surveyed by a Mineral Surveyor approved by BLM and paid the necessary fees MS-02517 and submitted to the BLM this Mineral Survey on August 12, 1994.

Each year subsequent to the patent application I filed the annual labor affidavits and Small Miner Certifications requested by BLM. In one year, August 1993, the maintenance fee of $100 was paid *twice* for every claim. In January of 2005 I was advised BLM had no record of the labor affidavit for 2004. Although they did acknowledge they had received the Small Miner Certification for that year and the BLM recording personnel recall me visiting their recorder's office. I appealed, but the decision relied on the odd notion that the BLM is presumed to do things correctly. Anyway, there was a mistake or two by the BLM and those mistakes lead us here today.

A detailed chronology of my claims and this situation that has developed is "Attachment 2". All of the history boils down to the fact that BLM has no record of my Affidavit of Annual Labor that I

left at the BLM when I filed my small miner waiver for the claim fee on August 10, 2004. However, this should not even matter because I had a credit, having paid the claim maintenance fee ($100 per claim), *two times in 1993*. BLM records indicate this is the case—and BLM regulations also state BLM will apply maintenance and overpayments *to future years*. Under Title 43, Chapter II Subpart D, Sec. 3830.22, BLM does not refund service charges or fees. Subsection (c) says that ***"BLM will apply maintenance and overpayments to future years"***. 43, Chapter II, Subpart D, Section 3830.22. Therefore, I had a credit of $1800 credit on BLM's books associated with each of these claims. So, even if someone believes that my Affidavit of Annual Labor was not filed with the BLM, then the agency should have applied the reserve associated with each of my claims, for the year they say I missed the filing of paperwork associated with the small miner exemption.

Additionally, BLM should have given me written notice of the deficiency and allow me the time dictated by Titles 30 and 43 to correct the deficiency with the small miner waiver and associated Affidavit of Annual Labor. Title 30, Chapter 28f . (d) (3) (A) & (B): ***" If a small miner wavier application is determined to be defective for any reason, the claimant shall have a period of 60 days after receipt of written notification of the defect or deducts by the Bureau of Land Management to (A) cure such defect or defects, or (B) pay the $100 claim maintenance fee for such a period.*** BLM had definite responsibility to notify me and did not send a notice of defect of the small miner application, but they also failed to apply the apparent credits, or in this case apply $100 to each claim in question, in lieu of the small miner waiver and Affidavit of Annual Labor.

It is also worth noting that past correspondence between Senator Murkowski and the BLM attempt to make an issue that I filed an additional (subsequently dated by about a week) affidavit of annual labor with the State of Alaska to cover myself with any of their requirements. This document was provided by me to show I had complied with the State of Alaska's recording requirements in a timely manner. The notary date is different than the one I left at BLM because the document filed at the State of Alaska Recorders Office was drawn up subsequently.

Patent Delay

All of the mistakes noted above would have been irrelevant if the BLM would have done what it should have done on August 12, 1994, and processed my filed mining patent application by forwarding the notice and telling the newspaper to publish it. (Bureau of Land Management Guide to Preparation of Mineral Patent Applications, REV 87-982, page 17) As a point of fact, I requested accelerated publication on my patent in a letter to BLM on September 1, 1994. Had this *pro forma* step been achieved, my claims would be in the position that your bill puts them in under subsection (b)(1). Then, if need be, by operation of subsection (b)(2) under your bill, I would have the opportunity to cure, if needed, as offered under section 10101(d)(3) of the 1993 Budget Reconciliation Act, meaning I would be eligible to cure any defect. This would give BLM a chance to properly apply the overpayments in 1993 to the claim maintenance fees they say were due. This bill would place me where I would have been—with a first half final certificate in the patent process—had BLM taken the required step to process my patent. In short, this would make me eligible to receive a mineral patent for my claims under the mineral survey that I filed before patenting was suspended.

Supposed Top Filers

It is amazing to me, as we have worked on the bill over the years, what people have tried to do in the vetting process—always at the last minute and always without documentation. I hear of "objections" because somehow your straightforward bill would supposedly expose the US to damage claims from so called "top filers," people who filed mining claims over top of mine, in case I dropped them. Of course there are top filers in all sorts of mining situations and this did happen to my claims. I will explain.

Regarding claims referred to as the "Grubstake Claims" which Robinson Wallie and William Gregory John top-filed on March 30, 2010. The Location Certificate for the "Grubstakers Canyon Creek" AA92397, *specifically excluded all of my claims.* The Location Certificate make a claim to my claims, "less all Patented and un-patented claims including MS2517, Final Drive CB and Penny #1. The MS2517 claims are my claims, so these are exempted from the Grubstake Claim. On March 11, 2010, BLM determined that claim was "Too Large" and on July 1, 2010 the claim was declared by BLM, to be "Null and Void." On July 21, 2010, almost three years ago, the case was "closed" according to the BLM records. This was a State of Alaska Filing not a Federal Mining Claim. According to BLM personnel, Sec 4 and Sec 9 of Township 7 North, Range 1 W of the Seward Meridian, was under a proposed State Selection process and therefore was not open to Federal Mineral Location.

Regarding claims called the "Weber Claims," most of them were abandoned or voided in the late 1980s or early 1990s,except for one active Weber Claim, AKAA023747, is outside the boundary of my claims, so it is irrelevant.

Regarding a claim that is referred to as "Patricia O Akaa," I think Patricia O is the name of the claim. If you look at the map of the claim location, Redmond clearly top filed on at least three other mining claims, including the one claim which was part of MS2517, my claims. The owner or owners of the claim locations notices are conflicting. The "discovery" date is the same, but at each location the notice is signed by a different person. There is only one top filed claim which is conflicting is the Patricia O. The other two claims "the Charlotte No. 1 and the Charlotte No. 2. are located on Ingram Creek some 22 miles away. This is also a State of Alaska Mining Claim top filing, so S. 366 restoring my prior claims to me will not impact a subsequent filer based on the State of Alaska's subsequent selection of land in and around my claims. (See state selection map.)

Regarding claims filed by Woody Jones, Mr. Jones sold me part of my claims that make up MS2517. After Woody sold the claims to me, he thereafter, by proxy, top filed over *the same claims he sold to me.* These claims were located in June 1986, after mine. (See August 20, 1992, letter from BLM to Mr. Jones). These are the only claims that have been alleged to be in conflict with mine. If the BLM would have properly processed patents on my claims before the moratorium, these top filings would have been irrelevant to the issuance of my patent, just as they are irrelevant to your bill. What S. 366 does is put me in the position I would have been in if BLM had processed the patents by giving me first half final certificate on MS 2517 and properly applied the overpayments should the patents not have been issued by time of the paperwork glitch

described above. So your bill places me in the position where my claims were starting on February 23, 1982, the date that the claims were located. This position is superior to the subsequently located Penny Claims (1-7) located in June 1986. This first half final certificate and a patent—whether granted in regular order as it should have been or directed through S. 366—has no bearing on the rights of the subsequent filer (or holder) of the Penny Claims (1-7), as my claims are first in line.

Additionally, in between when my claims were located (1982) and the Penny Claims were located (1986), the State of Alaska made its state land selections. These selections that included my claims were made on December 23, 1983, I believe, (See State selection map noting "23 Dec 83" on the bottom of the map), so they put the State of Alaska behind me and ahead of the Penny Claims. S. 366 that restores me to the position as if BLM had properly processed my patents applied the overpayments if the patents had not been issued by the time of the paperwork glitch. This takes nothing from the Penny Claims because the State of Alaska selections would cut off the Penny Claims anyway.

Lastly, Woody Jones, the supposed owner of the Penny Claims died on September 6, 2002. (See death certificate and will). In BLM case files, there is a reference that there is a transfer from Jones to Odenthal. BLM's file has a "General Will" from Jones where he bequeaths the "Penny Claims (7) and the Wagner Clam to Rod Odenthal of Wasilla." Rod Odenthal subsequently transferred the claims into his name. I find no document in the current BLM case file showing any such transfer, but there is a reference by BLM from Jones to Odenthal, as I mentioned. However, the signatures do not appear to match other Woody Jones or Woodrow D. Jones signatures. (See the earlier Money Receipts from Trautner to Jones dated Jan 31, 1985 receipt #95198 and #9519). If you look at the "Affidavit for collection of Personal Property of Decedent" (a post-Jones death document) and compare the signature in paragraph one of Woodrow Deering Jones, and compare the Woodrow Deering Jones written in the blank and the signature on the "General Will" "signed" on August 28, 2002, allegedly signed by Woody Jones, the signatures are quite similar, so I would not think that this transfer is valid anyway.

Under the Application For Patent provisions, my claims were posted for six months prior filing the Patent Application with BLM as required under BLM regulations. The claims were clearly identified including all conflicting and adjoining claims including those top filed by Jones. *No one, no alleged holder of any overlapping claim came forward or contested the claim postings during the six month posting period.*

Any of these factors alone indicate that placing me where I should have been—with first half final certificate –will do no harm to the government from subsequent claim filers.

But again, even if the Woody Jones bequeath were to somehow be valid to Odenthal, the bequeath would be a bequeath of nothing at all given the validity of my claims as clarified by Congress under this bill. At a minimum, Congress is changing no facts, but rather telling the BLM to do two things that it should have done long ago: (1) give me the first half certificate, which should have come long ago before the patent moratorium and, if the claims had not received patent in 2004, (2) to restore my claims from a subsequent error that was either BLM not properly recording the Affidavit of Annual Labor that I left with them in August of 2004 *or* properly apply the

overpayment (double payment) made in 1993 to the alleged 2004 mistake related to the Affidavit of Annual Labor. Doing these things makes me whole and therefore takes nothing from others who are subsequently in line, if my claim to these properties is given away.

Thank you for considering my testimony.

Attachment 1

On August 10, 2004 I, went to the BLM recorder's office in Anchorage, Alaska, and filed a small miners exemption certificate (Maintenance Fee Waiver Certification) at the same time I also left my Affidavit of Annual Labor for recording with a BLM employee at the counter. I believe it was Ms. Peggy Richardson, who at the time was taking care of several people at the counter. As I recall there was some problem with the computer and printer and so I left the packet at the desk.

As in the past, I left cash (two twenties and a five dollar bill) in an envelope for the recording fee. Another employee in the BLM recorder's office Juana Fisher remembers me distinctly as the miner who "always pays cash" when I file my labor documents. The Waiver Certification was stamped in at 2:29 p.m. on August 10th, 2004.

Subsequently, on August 25th, 2004, I filed an Affidavit of Annual Labor in the State Recorders Office in Anchorage to comply with State of Alaska mining regulations.

I thought everything was fine until I received the letter stated my claims had somehow been forfeited. I immediately went to the BLM recorder's office and talked to Ms Richardson and Ms Fisher. I then called Ms Evie Punches , and asked for a meeting the following morning. Ms Punches attended with two other members of BLM. I explained my dilemma and that I had filed the affidavit which they say now they have no record of receiving.

When I discussed my problems with the two employees in the BLM Recorders office on January 31st 2005,, they said they recall having computer problems, but could not pinpoint a specific date.

It should be noted that since November of 1982, for over twenty-two years, I have filed the annual assessment each and every year as required by regulations.

I believe a clerical problem ensued and the BLM record is incomplete and not accurate. If you view Exhibit #2, you will note there are two recording dates on the Case Abstract. This document shows a Small Miner's Certificate filed August 9th a full day before the Maintenance Fee Waiver Certificate document was recorded on August 10th 2004, the date which I visited the BLM recording office.

When visiting the BLM Recorders office to review the case files on the claims in question I was told "the files I were reviewing were the 'Dummy' files and the originals files were being held upstairs by the adjudicator for possible court action." Obviously this did not allow me to ascertain what the other document "Small Miner's Certificate" noted as entered in the Lead Case file is, and or, if in fact even exists.

How was this August 9th date possible?, the BLM employees I talked to couldn't explain it. The stamp is a full day before the date I left my documents for recording. I was told the documents are first logged in on the first floor, and then are sent upstairs when they are again logged in again

according to BLM personnel. Perhaps this second document was in fact the missing Labor Affidavit. Therefore the entire transaction appears flawed and I suggested to rectify it my Affidavit of Labor be accepted and recorded again.

Subsequently, I filed a NOTICE of APPEAL and a REQUEST for a STAY in a timely manner. It should be noted the copy sent to the Board of Land Appeals in Arlington, Virginia was returned to sender see as undeliverable. Not once but twice see US Postal Service Receipts #7004289000028592 dated February 25, 2005 and #70042510000199034481 dated March 22, 2005.

On January 31, 2005, I pulled an abstract of the Lead Case AKA-047916 (WAGNER # 2) on these mining claims. It appears the other eight claim abstracts pulled on March 1st 2005, may have been altered or intentional omissions made as they do not show a August 9th recording date.

The block of claims have been a family effort since 1982. The Patent Application was the accumulation of a great deal of money and work by family members Rik Bucy,, Gary Bucy, Kathy Bucy Trautner, the heirs of Colleen and Norman Bucy and myself.

It is pertinent to observe that this is the second time BLM has made an error in recording when making a decision concerning one of these mining claims. On July 29th 1993. a notice was send to me declaring a decision had been made that AKA-049713 was no longer valid and that the claim was void, "MINING CLAIM DEEMED ABANDONED AND VOID AND CASE CLOSED} In that instance, I called a Ms. Lois Simenson, Chief of Public Services at BLM's Alaska State Office and spoke to her concerning the matter, stating that BLM had received the affidavit as well as a cash payment on August 13th 1992, I responded in writing to BLM. Recognizing their error in their decision of August 30th 1993, I was notified the "DECISION OF JULY 29, 1993, VACATED IN ITS ENTIRETY'.

HISTORICAL DATA:

The following is a brief narrative concerning mineral claims AKA-023149, AKA-023163 and AKA-047913 through AKA-047919 and Mineral Patent Application AKA-072648.

In 1982, I acquired the first three minerals claim of this group from Mr. George Hayes, Subsequently, I acquired additional claims from Messrs. Tommy Dixon, W.D. Jones and Stanley Palmer.

On April 1st, 1990 an Application for Survey was submitted to the BLM along with a $2650.00 payment. The survey was completed by Maurice P. Oswald of Anchorage, Alaska and the mineral survey was submitted and accepted by BLM, US Mineral Survey MS-02517. The formal MINERAL PATENT APPLICATION dated August 8th, 1994. was filed on August 12th 1994, along with the required $650.00 filing fee, prior to the moratorium on patents being established and implemented. I believe I should have been grand-fathered under the 1995 Appropriations Act, and had the BLM acted in timely manner my patent application would have been completed and issued by now. A Chain of Title search was completed and submitted with the above application as

well as supporting documentation, including a prepared notice of Publication.

Each and every year the assessments were filed in a timely manner as can be seen from the Case Abstract File for AKA-047916 the lead case file.

In Accordance with 43 CFR 715.4 ON September 23rd 1996, a "MANAGEMENT OF USE AND OCCUPANCY EXISTING OCCUPANCY NOTIFICATION "was filed with BLM .

In summary, I obtained a copy of the title Case Abstract AKA-047916, and noted a significant error on the part of BLM which leaves me the question the authenticity of the entire recording process.. It shows a Small Miner's Certificate being recorded by BLM on August 9th a full day before I appeared at the Recording Office, on August 10th, 2004.

It appears the case files available for review are not the full and true document records. I was present at the BLM Recorders office on August 10th 2004 and left records for recording.

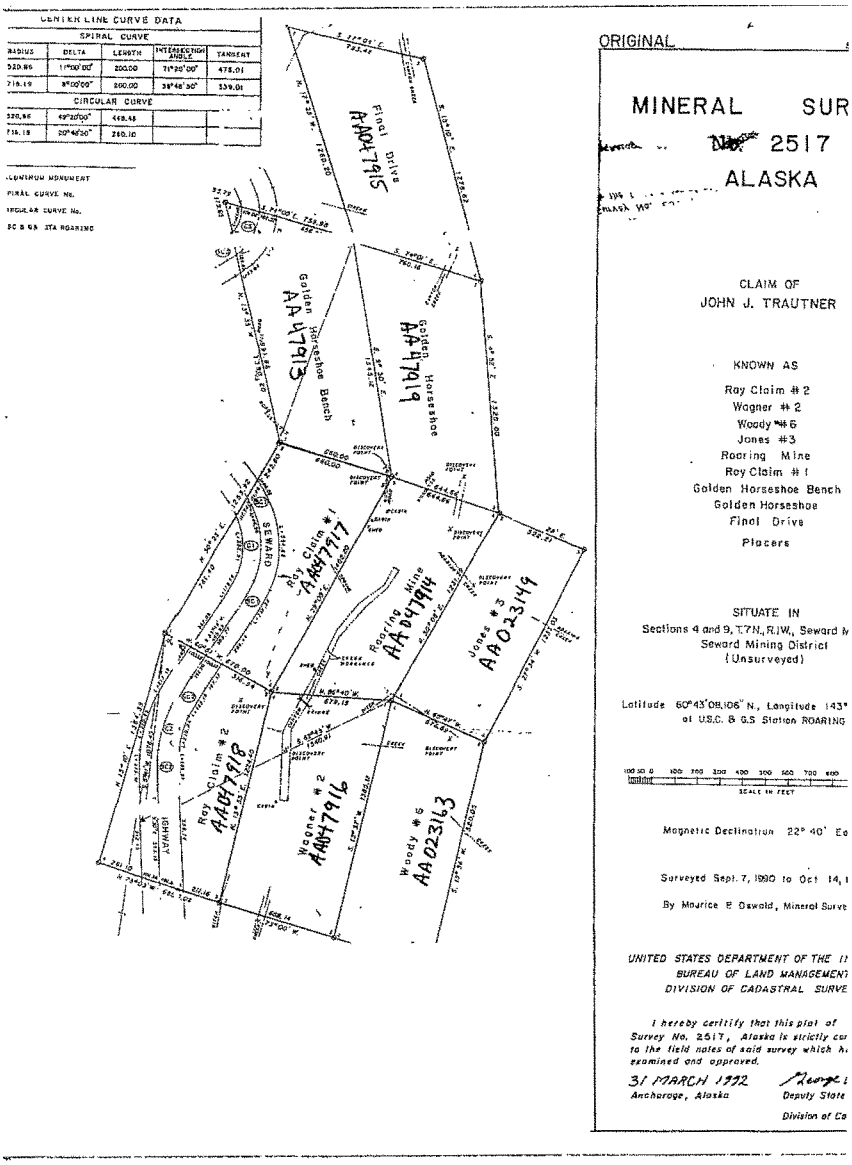
Case abstracts on these claims are inaccurate or incomplete.

Addresses provided in the CFRs provided to claimant for filing NOTICES of APPEAL not accurate.

The BLM has made mistakes before in documenting the filings associated with these claims and subsequent patent application.

I believe a substantial clerical error has occurred which leads me to believe the documents I left at the counter were mis-recorded or inadvertently misplaced or picked up by another person. This in turn lead to the notice of the invalidation of my claims.

Since December of 2004 I have continued to file Annual Labor Affidavits with the BLM which they have rejected.



ORIGINAL

MINERAL SUR

2517

ALASKA

CLAIM OF
JOHN J. TRAUTNER

KNOWN AS

Ray Claim #2
Wagner #2
Woody #6
Jones #3
Roaring Mine
Ray Claim #1
Golden Horseshoe Bench
Golden Horseshoe
Final Drive
Placers

SITUATE IN
Sections 4 and 9, T.7N., R.1W., Seward M
Seward Mining District
(Unsurveyed)

Latitude 60°43'08.106" N., Longitude 143°
at U.S.C. & G.S Station ROARING

SCALE IN FEET

Magnetic Declination 22° 40' Ea

Surveyed Sept. 7, 1990 to Oct 14, 1

By Maurice E Oswald, Mineral Surve

UNITED STATES DEPARTMENT OF THE I
BUREAU OF LAND MANAGEMENT
DIVISION OF CADASTRAL SURVE

I hereby certify that this plat of
Survey No. 2517, Alaska is strictly co
to the field notes of said survey which h
examined and approved.

31 MARCH 1992
Anchorage, Alaska

Deputy State
Division of Ca

OF THE SEWARD MERIDIAN, ALASKA

2	1
1	12
4	13

STATUS OF PUBLIC DOMAIN
LAND AND MINERAL TITLES

MTP

INDEX TO SEGREGATED TRACTS				
RESURVEY	ORIGINAL SURVEY			
TRACT NO	T	R	SEC	SUBDIVISION

FOR ORDERS EFFECTING DISPOSAL OR USE OF UN-IDENTIFIED LANDS WITHDRAWN FOR CLASSIFICATION MINERALS, WATER AND/OR OTHER PUBLIC PURPOSES REFER TO INDEX OF MISCELLANEOUS DOCUMENTS.

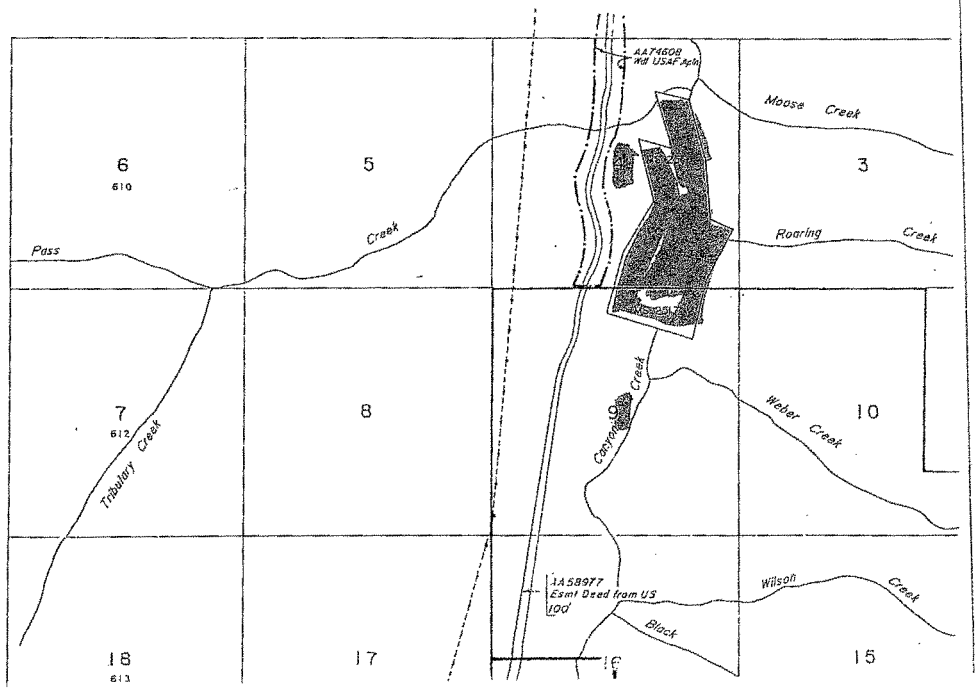
Wdl Chugach NF entire Tp.

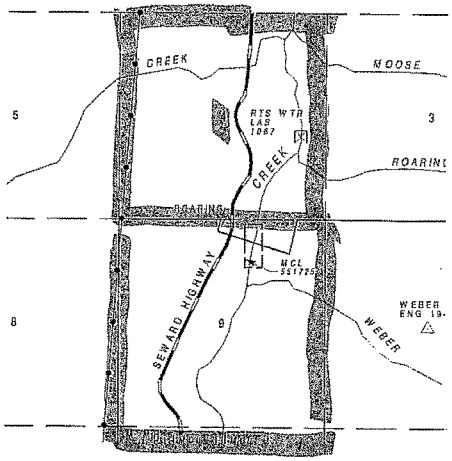
PL 167 (let comp entire Tp (A050732)

[redacted]

UNSURVEYED TOWNSHIP 7 NORTH, RANGE

PROTRACTION DIAGRAM S16-6 OFFICIALLY FILED 5/8/1963



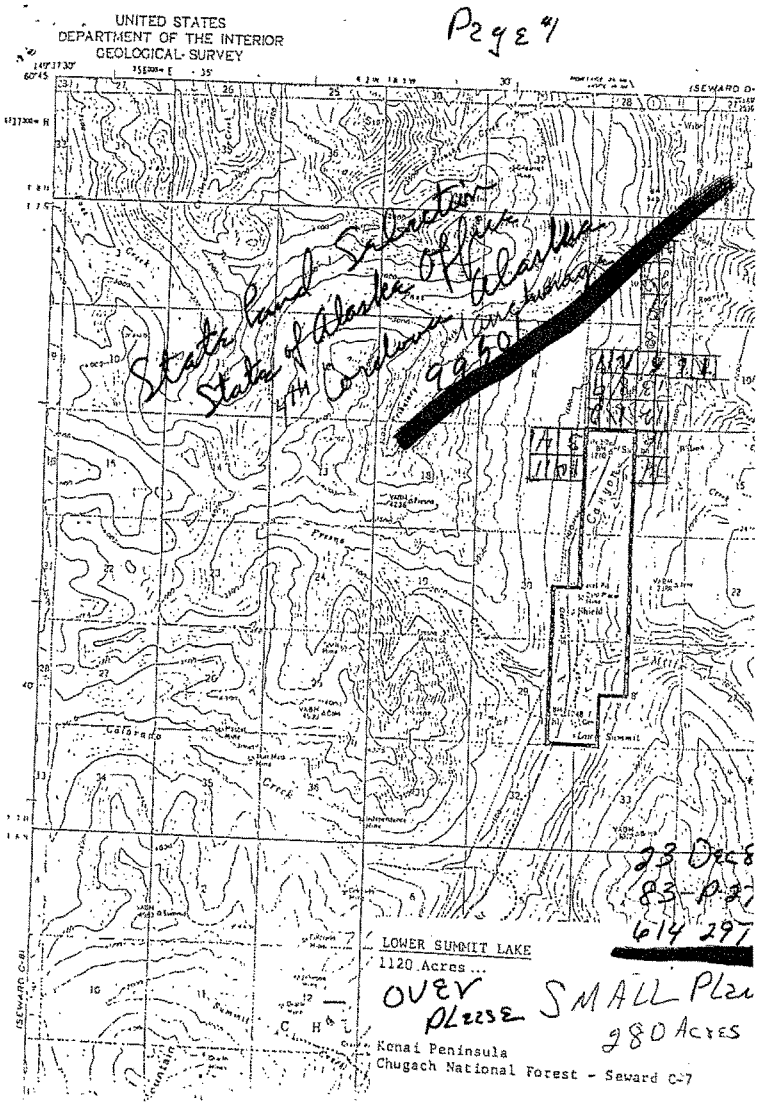


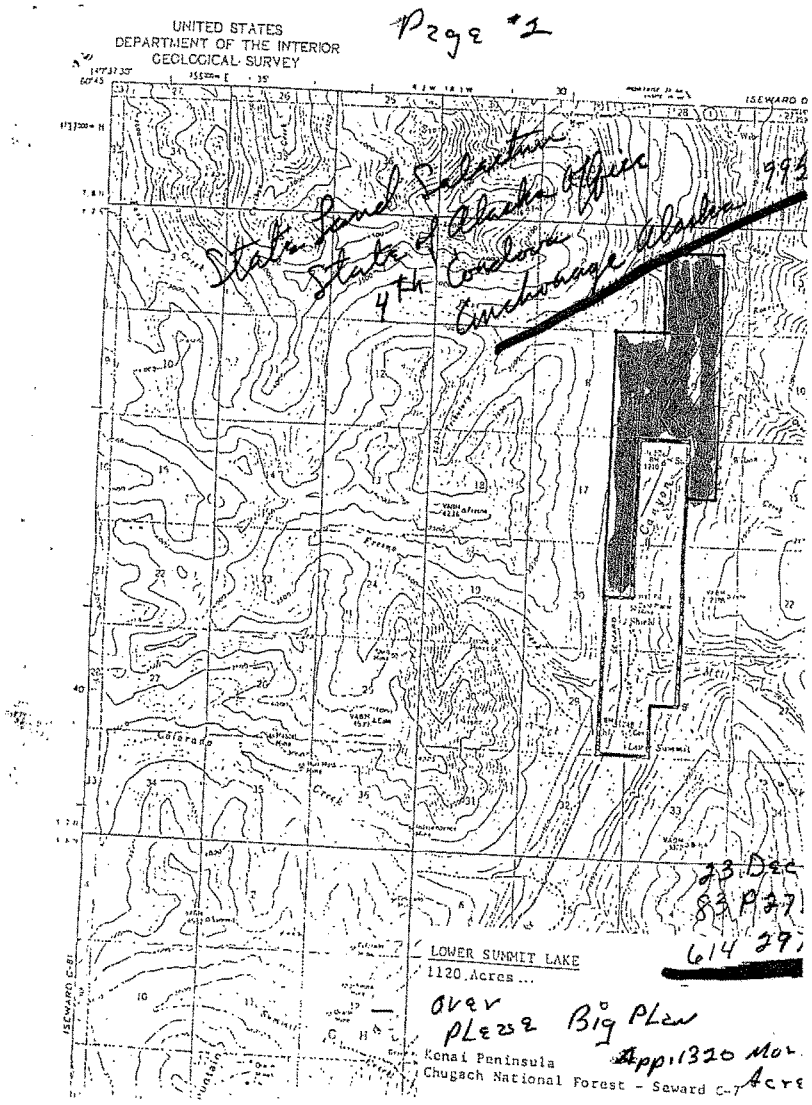
From State Land Records

AA 72648

1) (State Selected)

2) Find Quarter Sections (NE Corner Location)


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Page 4
State Land Selection
State of Alaska
4th Corner
9950
23 Dec 8
83-P 2
614 297
LOWER SUMMIT LAKE
1120 Acres ...
OVER
PLEASE SMALL Plan
280 Acres
Kenai Peninsula
Chugach National Forest - Seward C-7


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Page #1
State Land Selection
State of Alaska Office
4th Avenue
Anchorage Alaska
23 Dec
83 P27
614 27
LOWER SUMMIT LAKE
1120 Acres ...
over
please Big Plan
App. 1320 More Acre
Kenai Peninsula
Chugach National Forest - Seward C-7

From: Dave Kukowski <dkukowski@alaskascrap.com>
Sent: Monday, July 31, 2017 6:15 PM
To: Kleeschulte, Chuck (Energy)
Subject: Statement for claim at Chicken in the Fortymile District

To whom it may concern,

i went into BLM to file other paperwork and my small miner's waiver and they would not accept the waiver because of the time clock date. The date was not the correct year and I was in to early. They said that they would not accept my paperwork at that time, so I began my mining season. At which time, the fall has arrived and I went back in to file my affidavit for manual labor, at which time they informed me that my claims were now invalid. I was 26 days late from filing the waiver and they would not accept it. A person would not lose their house from a 30 day late payment, or your credit or car, or your lively hood. I've been mining these claims since 1969. And at the time I was under an active mining claim permit that was good for 5 years. This should tell you that I wasn't trying to let my claims go. I can't understand how the government could mess up someone's lively hood at such a small issue. I've been working very hard with reclaiming and cleaning up this mine site every years since we've lost it. There has always been issues involved whether elements, high water, my father's deaths, and now I'm dealing with my mother's death. This has been a great blow to all of us, the loss of our mother this year. With learning a new career in the work field and having a new job, it's not easy to get away like it was when we were self-employed. As I have my own family to feed, this whole thing has been a real burden. I've been trying my best to get the mine done and finalized so I could get on with my life too. I never wanted to lose these claims and I'd like to have them back. These mining laws were to be written up in laymen's terms and I'll bet you, you could give it to any college degree person and they would not understand it. Something needs to be fixed, because they are not in laymen's terms. I am presently heading up to the mine to finish up the reclamation down river which should take me a week to ten days, at which point everything else should be done, except for the removal of my mother's cabin.

Best Regards,

Dave Kukowski

To : Senate Energy and Natural Resources Committee as well as all involved Parties,

My name is Michael Kukowski and my brother David and I took over our family owned gold mine when my father passed away in 1994, this letter is put forth today in hopes of your consideration of this Senate Bill 884 and badly needed language that is in it to reinstate and rectify a wrong.

My family of 7 brothers and 4 sisters have all been raised to a gold mining family and business that my father started well over 60 years ago in Chicken Alaska. We all were raised at the mine until the age of 18 where some family members had enough of mining and moved on to create their own careers and some of us stayed to keep the family mine in business, which by the way was a great business and it kept our family in food, school and clothes throughout the winter months when we moved back into Anchorage. It also provided the grub stake for the following year to gear up for mining again with food and fuel to get us through the mining season as well as cover incidental equipment repairs or upgrades.

We (The Kukowskis') have lost our gold mine and our livelihood where 11 children were raised every summer of our lives to an infraction, a loophole or technicality that shouldn't even be a part of our countries laws. Even the IRS penalizes or fines a family for a late filing, they don't take their livelihood away from them and lock up their land, only to have to go through years and years of litigation only to be denied in the appeals process. This Bill put before you is a badly needed instrument necessary to make changes in process for miners so what happened to our family can be rectified as well as to prevent this tragedy from happening to other miners in the future.

It has been a over 10 year battle with BLM to no avail, they shut us down initially to exploration only and then within the next couple years thereafter told us we have lost our mine because we filed our assessment paper work past the deadline to file. We had a 3 year plan of operation already approved and in place! We hired attorneys and filed appeals till we couldn't afford to any longer, all to be DENIED and be told we have NO chance of mining ever again and to start reclaiming all the land and tear or burn down all of the buildings that our family built or they will do it for us and back charge us.. Again, we already had a 3 year plan approved and in place. This is our family mine where there is generations of land still left for our kids to carry on the tradition. Currently we are still in the long process of reclamation and destruction/removal of our family's cabins and have been given a few extensions by BLM to do this work because it has been decades of a family business and a mine didn't grow to this size in just a decade...While we do appreciate consideration at this time for another 2 year extension of this reclamation process that is needed due to weather and high rivers preventing us from completing the process of reclaiming the land and removal of structures ,solid waste and equipment in the time frame given to us of Sept. 1-2017, Passage of this Bill would right some wrongs done here by our own Government and give the miners some breathing room to get filings done AFTER mining season is over, not when they are crunching their time before freeze up and have to stop what they are doing to run into an area office. Your consideration for this Bill would be a great justice to the people of this country, the Miners and Associations that have worked so hard along side with Senators to develop this Bill and resolution of relief.

Thank you for your consideration,

Michael and David Kukowski , Ingle Creek mining, Chicken Alaska.

From: Carol Thurneau <carolthurneau@yahoo.com>
Sent: Tuesday, July 25, 2017 8:35 PM
To: Kleeschulte, Chuck (Energy)
Subject: Loss of Mining Claims

First and foremost I would like to thank Senator Murkowski for bringing this issue forward.

In our case, failure to provide in a timely manner a "copy" of our Proof of Labor form to the BLM, filed with the Recorder's Office in Fairbanks, resulted in the loss of our mining claim.

We have observed all the rules regarding reclamation and removal of all equipment. Every year upon inspection we were found to be in compliance with the BLM for the life of the claim.

To loss a claim of 38 years over a "copy" of a piece of paper seems unfair and unjust.

Thanks again for bringing this issue to a hearing.

Vernon A. Thurneau

David Guthert Statement In Support Of S. 884

In 1966 I staked 3 association claims on Bonanza Bar, on the right limit of the Forty Mile River, from the mouth of Canyon Creek to a point 1 & 1/2 miles upriver. In the early 80s I quit claimed all my holdings to my wife Roberta R Guthert because of a health problem I experienced at that time. The claim names & numbers are; Discovery on Bonanza Bar, F-53988, #1 Above Discovery on Bonanza Bar, F-53989, & #2 Above Discovery on Bonanza Bar, F-53990.

During the 70s & into the 80s my wife & I, with our 7 children, worked just downriver from Bonanza Bar placer mining with heavy equipment on French Joe Bar - We eventually sold the French Joe claims and planned to move our operation to Bonanza Bar. In November of 1987 I was out of state and mailed my proof of labor Affidavit to the BLM office in Fairbanks as usual but received it back from the USPS as undeliverable several months later. In trying to find out what happened, I learned that the BLM had moved and had a new address. I re-sent the affidavit to the new address with an explanation of why it was late. In August of 1988 I received notice that our claims had been declared null & void.

The proof of labor affidavits during that period of time were filed in a timely manner in the Fairbanks recorders office as follows: Proof of Labor Affidavit for 1986 recorded on 11-17-1986 in Book 505, Page 668. Proof of Labor Affidavit for 1987 recorded on 11-30-1987 in Book 40, Page 732. Proof of Labor Affidavit for 1988 recorded on 11-29-1988 in Book 599, Page 526.

S. 884 is a very common sense solution to clerical and other errors in properly filing mining paperwork and I heartily support its passage. If it had been in effect 1988 I am sure the loss of our claims would never have occurred.

Kake Tribal Corporation
P.O. Box 263, Kake, Alaska 99830 Phone: (907) 785-3221 Fax: (907) 785-6407

July 26, 2017

Honorable Mike Lee
Chairman, Subcommittee on Public Lands, Forests, and Mining
Committee on Energy & Natural Resources
United States Senate
Washington, D.C.
Phone: (202) 224-4971
Fax: (202) 224-7970

Re: Kake Tribal Corporation's Support of Senate Bill 1149

Dear Chairman Lee, and all other member of the Subcommittee on Public Lands, Forests, and Mining:

Please enter this letter into the record on the formal hearing for the Kake Tribal export ban repeal bill, or S. 1149.

I am the President/CEO of the Kake Tribal Corporation ("KTC"), which is an Alaskan-chartered business corporation formed pursuant to the Alaska Native Claims Settlement Act to receive land and money from the federal government in settlement of the aboriginal land claims of the indigenous people in the community of Kake, Alaska. KTC seeks to protect and preserve the well-being of its shareholders and Tlingit culture. To create job opportunities and revenues for our shareholders, KTC engages in responsible natural resource development by harvesting timber from our corporate lands.

In 2000, the federal government transferred 1,389 acres of federal land to KTC in exchange for KTC transferring 1,430 acres of its land to the City of Kake. While we were pleased that Congress approved this land exchange, it unfortunately included an export restriction that prohibited KTC from exporting outside of Alaska any of the timber it harvested from its newly acquired land. This restriction, contained in 43 U.S.C. § 1629(h), is what KTC refers to as the "timber export ban."

The timber export ban on KTC's timber harvested from its newly acquired land has left KTC at a significant disadvantage to its competitors and caused it to lose millions of dollars in revenue. At the time of the land exchange in 2000, the export ban was consistent with other timber sales from United States Forest Service lands, which could not be exported. The timber from these sales had to be 100 percent domestically processed in Alaska, and so did timber from KTC's newly acquired land. There were three major mills operating in Alaska at this time, in Wrangell, Ketchikan, and Klawock, and the thought at the time was that restricting Alaska timber exports would result in a more robust local market for timber thereby spurring local building. This forecast turned out woefully wrong and the export ban has hurt Alaskan timber

companies, particularly KTC which has been prevented from responsibly developing its resources to benefit its shareholders.

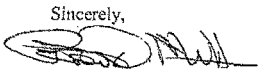
There used to be three mills, but Viking Lumber in Klawock is the only remaining medium-sized sawmill operating in Alaska. Viking Lumber recently signed an agreement with the U.S. Forest Service and acquired 100+ million board feet of timber near their Klawock mill. That wood will supply them with enough volume for the next 10 years. Given this ready supply of timber, Viking Lumber is unwilling to pay KTC enough to even cover its logging operations. In practical terms, this means KTC cannot log its timber.

Moreover, competing timber sales in U.S. Forest Service lands are now allowed to export timber. In 2008, the U.S. Forest Service changed its rules and now allows up to 50 percent of a total raw-timber harvest to be exported to the lower 48 and Asian markets. In November 2016, the U.S. Forest Service appraised its North Kuiu timber sale (approximately 25 miles from Kake) at 30 million board feet and 100 percent exportable.

How is KTC supposed to harvest its timber when the scales are so weighted against it? It is fundamentally unfair for federal law to prohibit KTC from exporting its timber sales, while its competitors that are harvesting mixed old-growth on U.S. Forest Service lands are permitted to export. In the Alaskan timber market, exporting is very much the difference between a profitable, thriving industry and an uneconomic, shuttered past time.

KTC appreciates this Subcommittee undertaking to level the playing field for it to compete in a fair timber market. KTC thanks the Subcommittee for its time and consideration of this important proposal to strike the timber export ban contained in 43 U.S.C. 1629(h).

Sincerely,



Robert Mills
President/CEO
Kake Tribal Corporation

cc: Members of Subcommittee on Public Lands, Forests, and Mining
Honorable Lisa Murkowski – Ex Official Subcommittee Member
Honorable Maria Cantwell – Ex Official Subcommittee Member

Frontier, Inc.

To: Energy and Natural Resources Committee Subcommittee on Public Lands, Forests and Mining.

Please place this letter in the record on the formal hearing for the Kake Tribal export ban repeal bill, S. 1149

I have been exchanging emails with Mr. Chuck Kleeschulte and Mr. Ryan West about the Kake Tribal Land Transfer Act of 2000 (PL. 106-283). At first I was not sure there was anything I could add that hadn't already been said in regard to the Land exchange and lack of payment to Kake Tribal Corporation.

After reading several documents, emails, and letters from Kake Tribal, lobbyists, letters and emails from USFS officials, letters from your office, etc....I came to a conclusion.

The Forest Service mentions several times the exchange of land and resources between Kake Tribal Corporation and the USFS must be "fair and equal" when in reality, that's far from the truth.

No one seems to have addressed the Elephant in the room. IT NEVER WAS A FAIR EXCHANGE!

Kake Tribal Corporation deeded over lands that had a value of $32 million dollars. (According to the Rickard appraisal) In return, they were to receive $15 million in cash, and land at Saginaw and Hamilton Bay with timber value worth $15 million to make it a fair exchange. Right there begins the unfair exchange.

That's not what they received. Kake Tribal Corporation put up the $32 million in timber property, and in return they received $12,949,000 and a parcel of land at Jenny Creek with an EXPORT timber value of $14,376,200. The caveat was, Kake Tribal had to agree to an export restriction on the Jenny Creek land they were receiving, making the value of the non-exportable wood $7,392,000.

Now, I'm not that good at math but I can see a huge flaw in the USFS argument that the exchange had to be "fair and equal." $32 million in exchange for $12,949,000 + $7,392,000 = $20,341,000. The difference still owed to Kake Tribal Corporation is $11,659,000!

The USFS argues that they never agreed to a set amount of $15 million dollars. According to Ms. Ruth Monahan, Deputy Regional Forester, the USFS never did an appraisal. Instead the USFS and CBO's office chose to use the Rickard appraisal. I

don't blame them. It was time consuming and expensive. Rickard's appraisal was even higher at $17,976,389 on the logging value of the property.

The "estimate" was $15,000,000 and could have been higher according to Rickard, which the USFS agreed was a legitimate appraisal. That's timber value only.

The CBO's office receives its figures from the USFS to come up with an estimate. All estimates given to the CBO by the USFS pointed toward $15 million. Those numbers were estimated by CBO's Megan Carroll and approved by the CBO's Peter H. Fontaine. Why wouldn't Kake Tribal expect $15 million?

Now the USFS say that timber values have dropped and they can't legally pay Kake Tribal Corporation any more money. It's not Kake Tribal Corporation's fault that the Federal Government has taken 17 years to come up with the money to pay them. The money was owed in 2000 and it's still owed today. What kind of America do we live in!? Kake Tribal Corporation should have been paid and the account settled by 2005.

To be a "fair and equal exchange," whatever amount the United States Forest Service is short in cash, they need to come up with in timber value. If they consider the $12,949,000 the total payment in cash, they need to come up with $19,051,000 in timber value. So far they have managed to come up with $7,392,000 at Jenny Creek. The USFS still owes KTC at least $11,659,000 no matter how you look at it. That would be a minimum payment.

I think in a civil trial Kake Tribal could prove greater losses. Their land was adjacent to the city of Kake with water, sewer and power available. It had a much higher development value after logging for residential and commercial value than the Jenny Creek property several miles from town with no utilities.

In my humble opinion it would be in the USFS best interest to take Kake Tribal Corporations offer to settle for $2 million and lifting the export ban, and feel lucky they haven't already been sued. I wouldn't quite call it a "criminal act" but it's surely a civil case the Kake Tribal Corporation could very easily win.

If this had been a "private party" deal between two Corporations, the lawsuits would have already been flying!

It's easy, as a large Corporation or Government entity to pass the buck and deny payment when it is due, but at the end of the day someone has to be held responsible. The USFS and US Government have already paid over $2 Billion in settlements in the last 3 years to Native Corporations that were treated unfairly. It's time for the USFS to pay its bills. Enough excuses.

Kindest Regards,

Clarence Maxey
Frontier, Inc.

Frontier, Inc. 414 N. Idaho Club Dr. Sandpoint, Idaho 83864 208-777-3183

Senator LEE. Senator Tester, go ahead and tell us what you have to say about this and include with that any pictures of Senator Daines' prom that you might have included with your presentation.

STATEMENT OF HON. JON TESTER, U.S. SENATOR FROM MONTANA

Senator TESTER. I am afraid they have all been expunged, Mr. Chairman.

I want to thank you for having this hearing and I want to thank Senator Murkowski, the Chairman, and when Wyden gets here thank him too and distinguished members of the Committee, thank you.

I want to give thanks for the comments that Senator Daines said. I think he laid out this bill very accurately, and I appreciate his comments.

It is an honor and a privilege to come before you today. This is an important bill for Montana's local businesses, especially those involved in the recreation industry, which is significant.

As you can tell by this picture, it is fair to say that these kinds of places do not exist just anywhere on Earth. It is a pretty special place. It is at the doorstep of Yellowstone National Park and at the headwaters of the Yellowstone River.

A while ago, probably a year ago, the local residents got wind of two mining companies that were planning to expand operations a short distance away from the doorstep of Yellowstone National Park. In fact, you can see where it says Emigrant Mining District, that is where it is.

This is home, as Senator Daines said, to world-class fishing, rafting, hiking and hunting, just about anything you want to do. It is an amazing, amazing area. And it is an ecosystem like none other in the world.

And so, what does this bill do? And I appreciate your comments, Mr. Chairman, about importation of minerals but I will tell you there are some places on Earth we simply should not mine. This is one of them. There are other places where it is entirely appropriate.

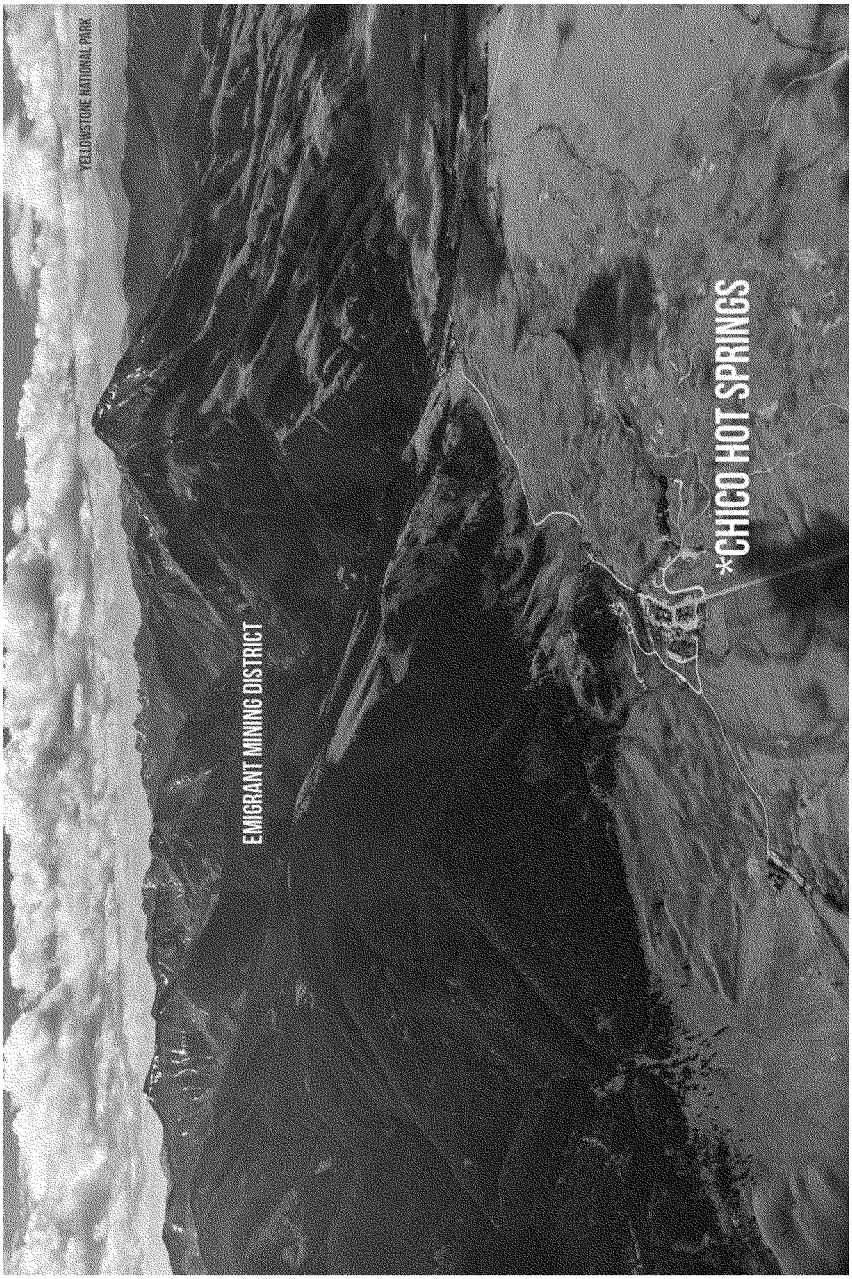
This legislation will help guarantee that large-scale mining will never threaten the headwaters of the Yellowstone or our premier national park in this country, Yellowstone National Park.

This legislation has broad support from Republicans, Independents, Democrats, Libertarians, you name it. Why? Because this is the gateway to the park and it is the headwaters of the Yellowstone. It creates millions of dollars in our economy, if not billions of dollars, and helps create a ton of jobs in the region over the long haul.

There are over four million people who visit Yellowstone National Park every year. Every one of them spend their hard-earned money in and around the communities of Yellowstone National Park, and if we screw up that park with a large-scale mine, we are not doing justice to the Earth or the people that live on it.

A picture is worth a thousand words and I just want to point out to you what we have here. I mean, this is amazing.

[The picture referred to follows:]

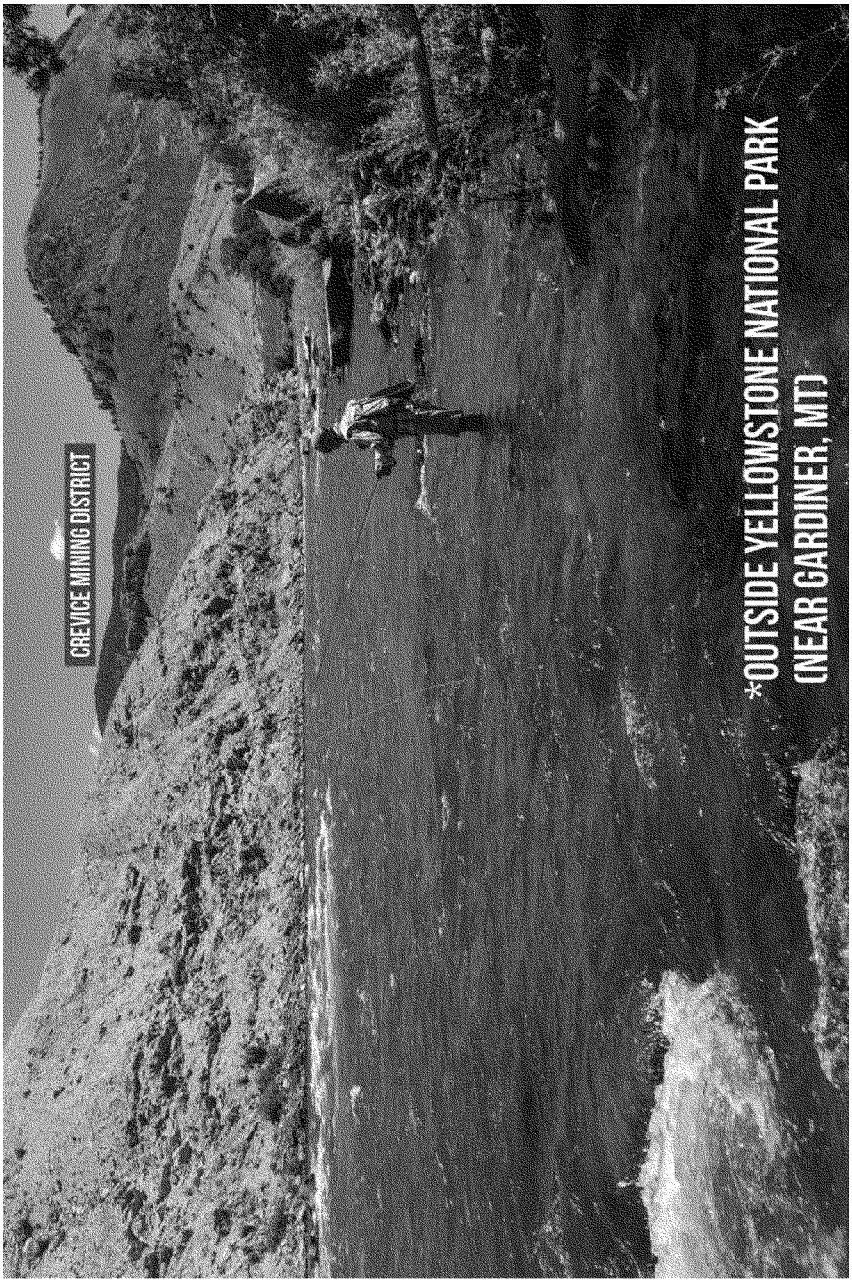

YELLOWSTONE NATIONAL PARK
EMIGRANT MINING DISTRICT
*CHICO HOT SPRINGS

Senator TESTER. Senator Daines is correct. There is another mine that does palladium and platinum. It is a zero-discharge mine, and it is a very good mine. There is no, absolutely no assurance that that is where we will end up here. We could very well end up in a situation like we have in Butte, where it is one of the largest superfund sites. Well, that is arguably one of the largest superfund sites in the world where it pollutes the waters downstream for hundreds and hundreds and hundreds of miles. And I would tell you, we do not want that because the impact it will have on Montana is—about $6.4 billion that goes into our economy every year due to recreation. A good portion of that comes right out of this region. This is where the mine would be. This is the Yellowstone River, the headwaters to it.

That said, this is what you do when you are having a bad day in Montana. The good day is when you pull a fish out of the water.

No, the truth is anytime you can spend time on a river with these kinds of waters and this kind of fishing, it's a pretty special time. And I will tell you—where is the Crevice Mine, right in here—impact of this is the biggest just outside of Yellowstone National Park near Gardiner.

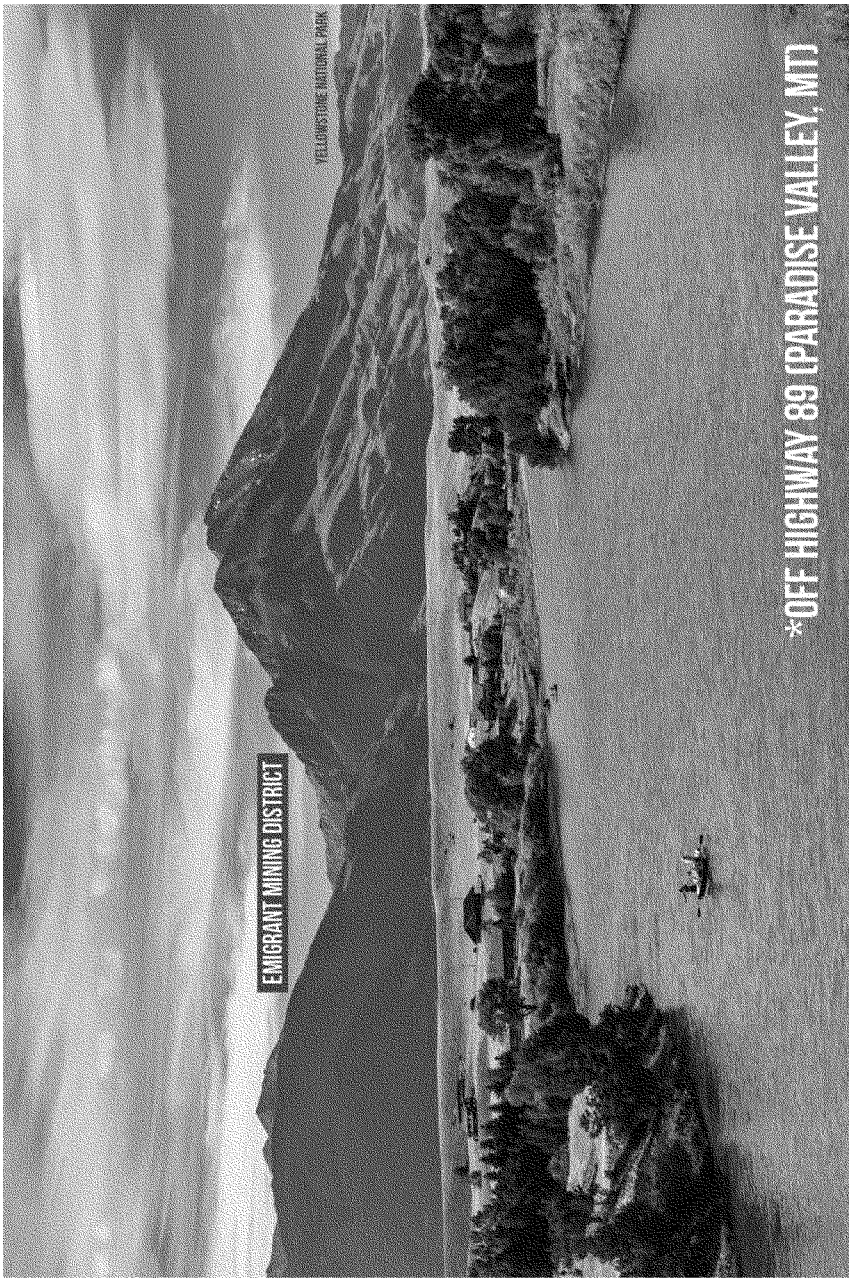
[The picture referred to follows:]



*OUTSIDE YELLOWSTONE NATIONAL PARK
(NEAR GARDINER, MT)

Senator TESTER. And finally, just the back view of it. This is a different picture of the first one I showed you, but this is the view back in where these mines are going to be. And this is Yellowstone Park over here.

[The picture referred to follows:]


EMIGRANT MINING DISTRICT
YELLOWSTONE NATIONAL PARK
*OFF HIGHWAY 89 (PARADISE VALLEY, MT)

Senator TESTER. It is just a magnificent country, I mean, it is a place you dream about when you are sitting in an office with no windows, to get out and be able to utilize this area. And it is why people come to places like Montana, why they covet places like Montana. If you put a mine here, I guarantee you it changes this landscape forever whether it is under the best intentions or not, it changes it.

So the bottom line is this. We have business people, we have local government-elected officials that say, "We don't want this."

And I would just say to this Committee, as you move forward, this is not about a mining ban. This is about making sure that we mine in appropriate places. This is not an appropriate place for a mine, not at the headwaters of the Yellowstone River, nor at the doorstep of Yellowstone National Park.

Thank you very much.

Senator LEE. Thank you very much, Senator Tester.

Senator HEINRICH. Senator Lee?

Senator LEE. Yes, Senator Heinrich?

Senator HEINRICH. I just want to thank Senator Tester for his advocacy on this. I had actually hoped to be visiting that region next week. We are going to be a little busy here on other business. But it is a place that draws Americans from every corner because it is so, so darn special and I appreciate you standing up for it.

Senator TESTER. Thank you, Senator.

If the Senate does their job, you will be able to visit there in four or five years and it will be the same.

Senator HEINRICH. Let's hope it does not take that long.

Senator TESTER. Thank you.

Senator LEE. Thank you, Senator Tester and Senator Heinrich.

Okay. I am not seeing Senator Wyden yet and I am not seeing Senator Hatch, so we will turn to our witnesses now.

Mr. Glenn Casamassa, Associate Deputy Chief of the Forest Service, and Mr. John Ruhs, Acting Deputy Director of Operations of the Bureau of Land Management. At the end of their testimonies, we will begin questions. Your full written testimony will, of course, be made part of the official hearing record. Please keep your statements, gentlemen, to five minutes so that we can have time for questions.

We look forward to hearing from each of you and we will begin with Mr. Casamassa.

STATEMENT OF GLENN CASAMASSA, ASSOCIATE DEPUTY CHIEF, NATIONAL FOREST SYSTEM, U.S. FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

Mr. CASAMASSA. Thank you, Chairman Lee and recognizing Chairman, Senator Murkowski, as it relates to the full Committee, as well as Senator Wyden, when and if he arrives.

I appreciate the opportunity to testify on behalf of the U.S. Department of Agiculture (USDA) and the Forest Service today on a number of bills.

My written testimony has been provided for the record.

To begin with Senate bill 941, the Yellowstone Gateway Protection Act, I want to emphasize our support for domestic energy and mineral production as an important use of National Forest System

lands. Mining and energy development is an important source of jobs and can be a driver of local economies, especially in rural America. Deploying modern technology, mineral and energy resources can be developed in many locations in ways that safeguard environmental protections. USDA seeks to manage these resources and activities in balance with other natural resources and economic drivers found on and around the national forests and grasslands. The balance is what we sought with the Administration withdrawal which is currently in process.

S. 32, the California Desert Recreation and Protection Act, and S. 1548, the Oregon Wildland Act, primarily affect the Bureau of Land Management and we defer to their views on the bills as they affect lands under their jurisdiction. For those wilderness and wild and scenic river designations in each bill affecting the National Forest, we'd like to work with the sponsors and the Subcommittee on a few specifics to ensure implementation would occur successfully and in balance with our overall, multiple-use mission.

S. 1149 would repeal the provisions in the Kake Tribal Corporation and Land Transfer Act which prohibit Kake Tribal Corporation from exporting timber from their lands. The Forest Service considers our role in this Act to be fully implemented. The Forest Service does not have a role in Kake Tribal Corporation's timber sale activities; therefore, we have no position on the bill. We are providing a statement for this on the record.

We recognize the significant role played by Charlie Fowler and Christine Boskoff in American and International Mountaineering and appreciate the desire to designate two unnamed mountain peaks in Colorado in their memory. While as a matter of policy USDA follows the direction of the U.S. Board on Geographic Names, it does not provide for naming an unnamed peak within Congressional designated wilderness. USDA does not oppose S. 1271 based on the contribution of Mr. Fowler and Ms. Boskoff in this field and the community support for these designations.

The Historic Routes Protection Act, S. 468, provides for Administrative resolution for claims of historic rights-of-way made under a provision from the 1866 Statute. The Forest Service understands the concerns this legislation is designed to address and appreciates the work of the bill's sponsors to craft a method to resolve these claims which, given the historic nature, can be extremely complicated to verify and establish. The Forest Service respects legitimate access rights held by public road agencies and is working to make strides to improve our service and partnership with state and local governments in meeting shared public transportation goals using the many existing authorities we already possess. We look forward to working with the sponsors and Subcommittee to address specific items in the bill that could pose implementation challenges if passed in its current version.

S. 1230, the Water Rights Protection Act, seems to ensure the Forest Service does not compel holders of state-granted water rights to convey these rights to the United States or acquire rights in the name of the United States in order to secure or maintain land use authorization. The Forest Service respects the primacy of the states in regulating water allocations consistent with both federal and state lands and seeks to be good neighbors and good part-

ners with states, tribes, communities, water rights holders and the general public we serve, in helping to sustain water resources on National Forest lands. That said, we understand the concerns driving the legislation and believe the primary goal of the bill is met by prohibiting these two specific actions. Beyond that, the Forest Service recommends only very specific amendments to the bill to ensure the land use authorizations continue to be issued in balance with other resource and social considerations to provide for responsible multiple-use management now and into the future.

Again, thank you for the opportunity to be here today. And I look forward to any questions you may have.

[The prepared statement of Mr. Casamassa follows:]

Statement of Glenn Casamassa
Associate Deputy Chief, National Forest System
U.S. Forest Service, United States Department of Agriculture
Before the
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests and Mining
Concerning
S. 32 – California Desert Protection and Recreation Act of 2017, S. 468 – Historic Routes Preservation Act, S. 941 – Yellowstone Gateway Protection Act S. 1230 – Water Rights Protection Act, S. 1271 – Fowler and Boskoff Peaks Designation Act, S. 1548 – Oregon Wildlands Act,
July 26, 2017

Chairman Lee, Ranking Member Wyden, members of the Subcommittee, thank you for the opportunity to present the views of the U.S. Department of Agriculture (USDA) regarding S.32 – the California Desert Protection and Recreation Act of 2017, S.468 – the Historic Routes Preservation Act, S.941 – the Yellowstone Gateway Protection Act, S. 1230 – the Water Rights Protection Act, S. 1271 – the Fowler and Boskoff Peaks Designation Act, and S. 1548 – the Oregon Wildlands Act. I am Glenn Casamassa, Associate Deputy Chief for the National Forest System (NFS), USDA Forest Service.

S. 32 – California Desert Protection and Recreation Act of 2017

S. 32 contains several provisions affecting USDA including an addition to the San Gorgonio Wilderness on the San Bernardino National Forest, establishment of sections of Deep Creek and Holcomb Creek and the Whitewater River on the San Bernardino National Forest as Wild, Scenic, and Recreational Rivers, transfer of administrative jurisdiction of 40 acres of National Forest System land to the Bureau of Land Management (BLM), and creation of a Renewable Energy Resource Conservation Fund. We defer to Department of Interior (DOI) for their views on sections affecting DOI agencies.

Section 1301(c), as added to the California Desert Protection Act of 1994 by section 101(a) of S. 32, would designate a 7,141-acre wilderness addition on the west and south ends of the existing 95,953-acre San Gorgonio Wilderness; this addition includes 1,000 acres of private property owned by the Wildlands Conservancy. The area that would be designated is currently an inventoried roadless area. USDA supports this wilderness addition as it would improve management efficiencies in this area, and we would like to work with the Subcommittee to ensure that the roadless areas can be consistently managed pursuant to this Act and the Wilderness Act.

Section 104(2) of the bill would amend the Wild and Scenic Rivers Act to add paragraphs (214) and (215) to designate approximately 76.3 miles of the specified rivers as part of the National

Wild and Scenic Rivers System. Of this total, approximately 34.5 miles of Deep Creek, including its principal tributary, Holcomb Creek, and approximately 17.1 miles of the North, Middle and South Forks of the Whitewater River are within the boundary of the San Bernardino National Forest and would be administered by the Forest Service. In order to ensure consistency with the current provisions of the Wild and Scenic Rivers Act and the 2014 Revision of the San Bernardino National Forest Plan, the Department would like to work with the Subcommittee to make some technical corrections in Section 104(2).

The Forest Service has found each of these rivers to be eligible for designation based on their free-flowing character and regionally important river-related values. USDA supports designation of these eligible rivers as Wild and Scenic based on general support from the communities of interest and consistency of designation with the current management of National Forest System lands within the river corridors.

Section 1705 of the bill would transfer administrative jurisdiction of over approximately 40 acres of National Forest System land to the BLM for inclusion in the proposed Alabama Hills National Scenic Area. This is an isolated parcel of land and the USDA supports the transfer of administrative jurisdiction to the BLM.

S. 468 – Historic Routes Preservation Act

S. 468 would create a new procedure for resolving claims for rights-of-way for roads and trails crossing National Forest System lands and lands managed by DOI agencies. USDA defers to DOI for their views on the effects of this bill on DOI agencies. An 1866 statute, known as R.S. 2477, granted rights-of-way on unreserved public land for public highways. However, since the statute did not require any documentation or recording to perfect the right-of-way, the legal process for identifying valid rights-of-way under R.S. 2477 can become costly and time consuming.

USDA understands and appreciates the interest in addressing issues associated with R.S. 2477, and would like to work with the bill's sponsors and the Committee toward resolving several outstanding concerns.

Current travel management regulations require the Forest Service to designate the system of roads, trails, and areas for motorized access on National Forest System lands through an open and public travel management planning process that allows for the balancing of road and trail access with other natural resource and recreational values. Under the Travel Management Rule Forest Service travel planning is closely coordinated with counties, states, and municipalities. These travel management regulations expressly recognize rights-of-way held by public road authorities, and exclude them from regulation by the Forest Service under the Travel Management Rule. The Forest Service frequently authorizes roads through the national forests that primarily serve as components of state and local transportation systems by granting federal road use permits, entering into cooperative road maintenance agreements, and issuing easements

to states and counties under various federal authorities. USDA believes the shared goal of federal, state, and local cooperation to meet transportation needs can best be met by effectively utilizing and applying existing statutory and regulatory processes.

Claims of rights-of-way under R.S. 2477 can be extremely complex on national forests, most of which were reserved by the early 20th century. Public highway rights-of-way under R.S. 2477 could only be established on unreserved lands, and therefore had to meet all elements necessary for perfection of a right-of-way prior to the reservation of land for national forest purposes. Considering that there is often no documentation or recording to evidence the creation of these rights-of-way, claim evaluation requires a detailed historical inquiry into the facts surrounding the establishment of the road.

R.S. 2477 claims on National Forest System land are currently handled on a case-by-case basis, and as a matter of law may only be brought by a government entity. USDA appreciates that the current processes for resolving these claims can, in certain circumstances, result in financial burdens to federal, state, county, or local governments, and the federal court system. The Forest Service also acknowledges that some governmental claimants have experienced delays and inconsistent responses due to the lack of a cohesive policy for addressing R.S. 2477 claims in the past and a lack of staff with expertise in the complex historical, factual and legal reviews needed to evaluate R.S. 2477 claims. Nonetheless, USDA believes that the procedures established by S. 468 could result in challenging new burdens and new issues. Such burdens and issues could be avoided under existing law because federal agencies are capable of making administrative determinations, and claimants may use the Quiet Title Act to challenge adverse administrative determinations within twelve years in federal district court.

USDA asserts that the current process of working with counties and states – where claims are dealt with case by case, mostly through granting of road permits, cooperative road agreements, special use authorizations, easements, and through the title claim process only when necessary – is preferable to S. 468. Where a state or county has an interest in maintaining a road as part of its public transportation system, the Forest Service has often been willing to grant easements under the Federal Land Policy Management Act or Federal Roads and Trails Act, or consenting to grant of Federal Highway Act easements. If these tools do not meet the needs of government road authorities, the Forest Service is able to make informal title determinations under R.S. 2477, which can avoid the disputes over title claims that can necessitate legal action.

Of significant concern is the workload that would likely be generated under S. 468. Section 3(3) would allow for companies and individuals to bring claims, in addition to states, counties, and public road agencies, and Section 5(f)(1) would require the Forest Service to review each claim within 120 days. This could result in thousands of claims that would not otherwise be brought. The Forest Service does not have the resources to evaluate thousands, or even hundreds, of claims simultaneously in a 120 day review period. This workload challenge is magnified by the likelihood that many non-governmental claims could be speculative and possibly conflict with

the preference of the state or county road agency that presently has the authority to assert such claims. The workload of responding to these claims would be considerable, and necessitate diverting resources from other critical Forest Service priorities. Additionally, the imposition of personal liability on government officials in Section 8(b)(2) will make it difficult for agencies to find personnel willing to participate in the review process.

We are also concerned about the potential administrative burden to state and local government agencies due to the proliferation of public rights-of-way should privately asserted claims be granted. As these rights-of-way would not be federal roads, they would be managed by state and local government. Some states such as Wyoming recognized the burden of allowing non-governmental entities to claim R.S. 2477 rights-of-way and acted to prevent this situation. In Wyoming, any R.S. 2477 claim that was not accepted by the Board of County Commissioners and filed in the county records by January 1, 1924 was precluded. *See Yeager v. Forbes*, 78 P.3d 241, 255 (Wyo. 2003). The clear Wyoming goal of ensuring local government control over the transportation system is a goal that is likely shared by other western states. Allowing individuals to make R.S. 2477 claims would run counter to that goal. If a county does not want a route established through a federal agency process by a private party, it would have to vacate that right-of-way. The county decision to vacate could be contested administratively and challenged in court. Further, if private entities bring claims without sufficient evidence, valid claims may be denied. There would be no opportunity to have a reviewing court supplement the administrative record.

One of the primary goals of S. 468 appears to be to reduce the need to resolve legal disputes in the courts. The Forest Service currently has the means to resolve or avoid legal disputes administratively under existing authorities. Both the Intermountain and Rocky Mountain Regions have worked on Non-Binding Administrative Determination policies to avoid the need for costly litigation. As best practices are developed they can be shared across other western Regions.

Another purpose of S. 468 is to achieve judicial and administrative efficiency (Section 2). The proposed mechanism for doing this is to move the initial review of R.S. 2477 claims into a new administrative forum where an administrative record would establish the relevant facts, presumably more quickly and at a significantly lesser cost than establishing the facts through a judicial process. Any subsequent judicial review would be limited to that administrative record (Section 6(a)(2)). Unfortunately, the goal of efficiency is in tension with the need for certainty of title. The requirement to complete determination of such complex issues on strict and short timelines will likely compromise the certainty of title. In typical circumstances regarding routes constructed over the public domain in the late 1800s or the early 1900s, the historical documentation necessary to prove, or disprove, the claim is very difficult to obtain. There is no central repository to query for the necessary facts. Federal records, county records, state records, local historical societies and historic newspapers are all consulted. When records are located, they are often in various stages of disrepair that are difficult to decipher, and often require

historical experts to place the basic record of evidence into context. Granting sufficient time and expertise for these reviews is critical given the interest in securing valid title – both for the claimant and the agency.

USDA would like to further engage with the Committee and the bill's sponsors regarding these complex issues and other technical and legal concerns in S. 468 toward the goal of reducing burdens on all parties, and resolving these land access issues efficiently and in cooperation with states and counties. Resolution of claims of interests in federal lands, including claims for R.S. 2477 rights-of-way, is an important component of the administration of national forests for all Americans. Access to national forests for the many goods, services, and opportunities they provide is fundamentally important, and road access through the national forests to meet the transportation needs of state and local governments is equally important. Again, we appreciate the interest in helping to address these important issues.

S. 941- Yellowstone Gateway Protection Act

S. 941 would withdraw certain National Forest System land in the Emigrant Crevice area located in the Custer Gallatin National Forest, Montana, from the mining and mineral leasing laws of the United States, subject to valid existing rights.

USDA supports domestic energy and mineral production as an important use of the National Forest System. Mining and energy development are an important source of jobs and can be a driver of local economies, especially in rural America. Employing modern technology, mineral and energy resources can be developed in many locations in ways that safeguard environmental protections. USDA seeks to manage these resources and activities in balance with the other natural resources, values, and economic drivers found on and around the national forests.

Toward that balancing effort, on November 22, 2016, the Bureau of Land Management (BLM) published a notice in the Federal Register announcing that the Forest Service had filed an application requesting that the Secretary of the Interior withdraw, for a 20-year term and subject to valid existing rights, approximately 30,370 acres of National Forest System lands from location and entry under the United States mining laws, but not from leasing under mineral and geothermal laws.

Publication of the Federal Register notice temporarily segregated the lands for up to two years from location and entry under the United States mining laws while the withdrawal application is being processed. The lands have otherwise been and will remain open to such forms of disposition as may be allowed by law on National Forest System lands, including leasing under the mineral and geothermal leasing laws. This notice also began a 90 day public comment opportunity to provide input on the withdrawal application, and announced a public meeting, which was held on January 18, 2017, in Livingston, Montana. Thousands of comments were received. These comments were largely, though not universally, supportive of proceeding with

the withdrawal application. On June 17, the Custer Gallatin National Forest released a scoping notice, the beginning of the formal environmental review process under the National Environmental Policy Act. The proposed action is to withdraw these areas from future mineral entry under the 1872 Mining Law, subject to valid existing rights, for 20 years. Passage of S. 941 would render this administrative withdrawal process moot.

S. 1230 – Water Rights Protection Act

USDA recognizes the primacy of the states to allocate water and defers to the states to manage their processes as they relate to appropriation of water from sources located on National Forest System (NFS) lands. USDA also strives to collaborate with state water allocation agencies and engage in their processes where appropriate.

The purposes of the NFS were established by Congress in 1897 and were primarily focused on the protection of water and watersheds and securing a continuous supply of timber. For more than 100 years, the American people have depended on the availability of clean water from the national forests and grasslands to support communities, agriculture, recreation, wildlife, and other needs. USDA, through the Forest Service, serves as stewards of the national forests, so that water remains available to meet the Nation's needs. Continuity of the Forest Service's multiple-use mission, including the ability of the Forest Service to appropriately manage use and occupancy of NFS lands, is vital to fulfilling that stewardship role for present and future generations. Abundant, sustainable flows of water are important for healthy watersheds, and healthy watersheds are critical to America's water supply. USDA and the Forest Service seek to be good neighbors and good partners with states, Tribes, communities, water rights holders, and the general public we serve in helping to sustain water resources on NFS lands.

USDA supports the overall goal of S. 1230 to ensure the integrity of state systems for allocating water and associated property rights for those who have obtained water rights in prior appropriation doctrine states. With respect to the Forest Service, S. 1230 primarily affects permits authorizing uses of NFS lands, including permits for grazing, recreational uses, water facilities, and a wide variety of other uses. Sections 3(1) and 3(2) of the bill would prohibit the agency from including in a permit a requirement that an applicant or permit holder transfer water rights to the United States as a condition of obtaining a Forest Service permit, and would prohibit the Forest Service from requiring an applicant or permit holder to acquire water rights supporting the authorized use in the name of the United States as a condition of the permit. USDA understands that these prohibitions address the bill's primary goal relating to the ownership of water rights, and USDA believes that implementing the provisions of Section 3(1) and Section 3(2) accomplish that goal.

However, four provisions in the bill do raise more fundamental concerns with regard to the ability of the Forest Service to fulfill its statutory mandates by appropriately managing surface occupancy through land use authorizations. These provisions could adversely affect the agency's ability to carry out its multiple-use stewardship mission for NFS lands under the

Multiple Use–Sustained Yield Act (MUSYA) and meet the requirements of other applicable statutes including the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA).

The language in Section 3(3) in combination with the phrase "or on any impairment of title" in Section 3(1) could have the effect of precluding any term or condition in a special use authorization that could be related to the exercise of water rights, since any such condition could be deemed to impair that water right. As a result, the Forest Service would lose a critical mechanism under the framework of federal law to appropriately balance the many multiple uses of NFS lands through land use authorizations if an applicant or holder of that authorization also held a water right under state law. We note that a similar bill in the House of Representatives, H.R. 2939, does not contain the language in Section 3(3). We recommend that Section 3(3) also be deleted from S. 1230 and that a targeted amendment be made to Section 3(1) to reinforce the intent of the savings clause in Section 5.

Additionally, the scope of the bill extends to unperfected or invalid claims of water rights. Section 2(2) defines the term "water right" to include water rights for which only an application for a state water right or permit has been filed. Under section 2(2), an applicant for a permit could challenge a condition in a Forest Service permit on the grounds that the condition would affect a requested water right or permit, regardless of whether the applicant would ever be able to legally acquire that right or permit from the state. Furthermore, to the extent section 2(2) appears to address only water rights that are acquired or put to beneficial use, the scope of the bill appears to be limited to water rights in prior appropriation doctrine states. This intent should be clarified in the definitions to expressly exclude water rights in riparian doctrine states, where water rights are appurtenant to the land.

The authority of the states to allocate and permit the use of waters in prior appropriation doctrine states is recognized by the Forest Service and federal law. However, section 4(2)(B) would potentially limit the agency's ability to develop and present accurate analyses of water resources in environmental analysis documents under NEPA that involve effects on groundwater and surface water in states that do not manage them as connected resources, potentially subjecting the agency to additional litigation or impacting pending litigation.

Section 5 provides that the prohibitions in the bill will not affect other applicable authorities (including the ESA and Federal Power Act). We also appreciate that Section 5 recognizes that the federal government owns a wide variety of water rights, including federal reserved water rights as noted in section 5(d). However, as stated above the prohibition in Section 3(3) on including terms and conditions in land use authorizations to protect water sources could affect the Forest Service's ability to comply with these and other applicable laws. We are also concerned that there could be a shift in the burden for protecting water resources to states, Tribes, or local governments. Targeted changes to Sections 3 and 5 could alleviate these concerns and clarify the bill's intent, so that the limitations on the Forest Service authority to

include terms and conditions in permits would not affect the agency's ability to comply with these other laws. Again we point to H.R. 2393 as an example of language that would bolster the intent of Section 5.

These comments pertain to the effect of the bill on the Forest Service and management of NFS lands. USDA defers to DOI to comment on the impacts of the bill on DOI agencies and the federal lands under their jurisdiction.

S. 1271 – Fowler and Boskoff Peaks Designation Act

S. 1271 would name one mountain peak within the Lizard Head Wilderness on the Uncompahgre National Forest for Charlie Fowler, and another peak in the same wilderness for Christine Boskoff. As a general matter, the Forest Service recommends adherence to naming guidance provided by the U.S. Board on Geographic Names (BGN), which discourages naming unnamed features within wilderness unless an overriding need can be demonstrated. In recognition of the contributions to mountaineering made by Fowler and Boskoff, USDA does not oppose S. 1271.

S. 1548 – Oregon Wildlands Act

Wild & Scenic River Designations

Section 202(a) amends the existing designation in Section 3(a)(69) of the Wild and Scenic Rivers Act to change the starting and ending points of the three main segments of the Chetco River consistent with the Siskiyou National Forest Land and Resource Management Plan. The total length of the Chetco Wild and Scenic River would remain 44.5 miles. In addition, this amendment would effectuate a mineral withdrawal of the Federal land within the boundary of the segments of the Chetco River designated as a wild and scenic river. Typically under the Wild and Scenic Rivers Act, only Federal lands within segments designated as wild are subject to a mineral withdrawal. USDA is supportive of these technical changes as they provide a more appropriate naming convention, and better reflect management classifications and direction for the Chetco River.

Section 202(b) officially changes the name of "Squaw Creek" to "Whychus Creek" to better reflect local usage, current geographic nomenclature standards, and the name change approved by the U.S. Board on Geographic Names in 2005. This section also updates the location description in the existing designation in section 3(a)(102) of the Wild and Scenic Rivers Act to incorporate several other name changes. USDA strongly supports this much-needed technical correction to remove the offensive name of the designations.

Section 203 would designate approximately 10.4 miles of streams on National Forest System lands as part of the National Wild and Scenic Rivers System: 5.9 miles of Wasson Creek and 4.5 miles of Franklin Creek, both on the Siuslaw National Forest. USDA defers to the Department of

the Interior in regard to the proposal to designate the 4.2-mile segment of Wasson Creek flowing on lands administered by BLM.

The Forest Service conducted an evaluation of the Wasson and Franklin Creeks to determine their eligibility for wild and scenic river designation as part of the forest planning process for the Siuslaw National Forest. However, the Agency has not conducted a wild and scenic river suitability study, which provides the basis for determining whether to recommend a river as an addition to the National System. Wasson Creek was found eligible as it is both free-flowing and possesses outstandingly remarkable scenic, recreational and ecological values. USDA supports designation of the 1.7 miles of the Wasson Creek on NFS lands based on the segment's eligibility. At the time of the evaluation in 1990, Franklin Creek, although free flowing, was found not to possess river-related values significant at a regional or national scale and was therefore determined ineligible for designation. However, USDA does not oppose Franklin Creek's designation at this time.

Section 205(a) would amend the Wild and Scenic Rivers Act by adding additional segments in the Elk River watershed to the National Wild and Scenic Rivers System on the Siskiyou National Forest. These additions would increase the Elk's designated wild and scenic river mileage from approximately 29 miles to 63.4 miles. USDA takes no position on these additional designated segments. None of the additional segments are currently identified as eligible or suitable for wild and scenic river designation under the 1989 Siskiyou National Forest Land and Resource Management Plan. However, USDA would be happy to work with the Subcommittee to provide additional relevant information concerning the Elk River segments identified in this bill.

Wilderness Designations

Section 301 of the bill would designate 56,100 acres managed by the Bureau of Land Management (BLM) and by the Forest Service as an addition to the Wild Rogue Wilderness. USDA supports this addition of wilderness on National Forest System.

Section 301(b) would expand the Wild Rogue Wilderness in Oregon by designating 56,100 acres of land currently managed by the Bureau of Land Management and the Forest Service as wilderness. The "Proposed USFS Wilderness" identified in this section and on the referenced "Wild Rogue Wilderness Additions" map is located along a "cherry stem" into the existing wilderness area. The "cherry stem" originally allowed for the existence of a Level II Forest System Road, part of the designated "Grave Creek to Marial Back Country Byway," and the continuation of the Marial Lodge, a permitted resort. Marial Lodge accommodates hikers in the spring, rafters through the summer and commercial fishing trips in the fall. Proposed boundary adjustments in this area appear to be consistent with the continuation of the present and current use of the existing facilities.

Section 301(b)(1)(A) also includes language that turns back administration of a portion of the existing Wild Rogue Wilderness from Forest Service to BLM management. The Forest Service is

currently authorized to manage this BLM area through a Memorandum of Understanding. USDA does not see any issues of concern related to management of this expanded Wilderness area. However, we would like to work with the Subcommittee to develop a detailed "inset map" in the legislation to ensure that the boundaries between BLM and USFS parcels are clear and unambiguous.

Section 302 would designate the Devil's Staircase Wilderness (30,540 acres) on lands managed by the Forest Service and BLM surrounding Wasson Creek. Approximately 24,000 acres of this wilderness would be on the Siuslaw National Forest. Section 302(h) of the bill also would effectuate the transfer of administrative jurisdiction of an approximately 49 acre parcel managed by BLM to the Forest Service to be managed as part of the Siuslaw National Forest. This parcel includes a site of cultural significance to the Coos, Lower Umpqua, and Siuslaw Indians. Approximately 7,800 acres of the NFS lands are within the Wasson Creek Undeveloped Area and were evaluated for wilderness characteristics in the 1990 Siuslaw National Forest Land and Resource Management Plan. The proposed Devil's Staircase Wilderness provides an outstanding representation of the Oregon Coast Range and would enhance the National Wilderness Preservation System. There is an existing road within the proposed boundary of this wilderness that would require decommissioning by heavy equipment prior to designation as wilderness or allowance for use of mechanized equipment for this purpose after the enactment. USDA supports the designation of the proposed Devil's Staircase Wilderness.

Other portions of this bill would designate additional BLM lands and rivers flowing on BLM lands and would be administered by the Secretary of the Interior. Therefore, USDA defers to Department of the Interior on these proposed designations.

This concludes my written testimony. Again I thank the Subcommittee for holding this hearing and providing the opportunity to testify, and I look forward to answering your questions at the appropriate time.

Senator LEE. Thank you, sir.

Before we hear from Mr. Ruhs, we see we have Senator Hatch here now and Senator Hatch is going to now present to us regarding S. 837.

Senator Hatch.

STATEMENT OF HON. ORRIN G. HATCH, U.S. SENATOR FROM UTAH

Senator HATCH. Well, thank you, Mr. Chairman.

Chairman Lee, today I would like to speak in support of the Southern Utah Open OHV Areas Act which would establish much-needed guaranteed protections for recreational access on roughly 20,000 acres of land in Washington County, Utah.

Down in Washington County, riding off-highway vehicles, or OHVs, is an integral part of the local culture. It is a way for the folks to get out and enjoy Utah, enjoy the land, enjoy the beautiful area, and experience the region's unique geography. It is a beloved pastime for families in southern Utah, and it is essential to the region's tourism industry. Just last summer I had the wonderful opportunity to see firsthand the region's trails, red rocks, and dunes. In fact, I rode in a dune buggy all across the famous Hurricane Sand Dunes with Washington County Sheriff Cory Pulsipher.

Unfortunately, for too long members of the OHV community in Washington County have had to deal with increased uncertainty about long-term OHV access. Over time, long-revered paths and trails have become more restricted, or sometimes even closed, and locals are left to bear the burden. That is why I introduced legislation that would give certainty to the OHV community by ensuring that the most treasured area for OHV access on the only remaining open OHV area in the entire county is preserved for future generations.

Most importantly, Chairman Lee, I am proud to say that this legislation reflects a truly collaborative effort. I am grateful to you and for the leadership that you provide in Utah, very much.

My proposal is the combination of extensive discussions between diverse stakeholders in Washington County that collectively wish to preserve recreational access in the Hurricane Sand Dunes by designating it as an open OHV recreation area.

This type of common ground exists because OHV access is more than just a priority for the county's recreational community. According to the County, events and riding in the Hurricane Sand Dunes also brings in at least $3 million to the local economy each year and it constitutes a significant tourist attraction for the region that draws outdoor enthusiasts from across the country.

I believe the open OHV access is one of the reasons that Washington County is one of the fastest growing areas of the United States. But as I mentioned, even as the County grows at one of the highest rates in the country, access to open OHV areas is becoming increasingly limited. To protect recreational access in the Hurricane Sand Dunes now and in the future, I have worked hard to establish a solution that enjoys the support of the County, OHV groups, the regional water conservancy district, and others.

I appreciate the Committee giving fair consideration to this legislation and providing me the opportunity to speak with you here

today. It is very meaningful to me and, of course, I hope that we can move this along so that the folks in Washington County are treated fairly and in accordance with what their reasonable desires are.

Thank you, Mr. Chairman.

[The written statement of Senator Hatch follows:]

Statement for the Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forest, and Mining
Provided to the Subcommittee for the Hearing to Receive Testimony on Various Bills, including The Southern Utah Open OHV Areas Act, S. 837
Orrin G. Hatch
July 26, 2017

Chairman Lee, today, I would like to speak in support of the Southern Utah Open OHV Areas Act, which would establish much-needed, guaranteed protections for recreational access on roughly 20,000 acres of land in Washington County, Utah.

Down in Washington County, riding Off-Highway Vehicles, or OHV's, is an integral part of the local culture. It's a way for people to get out and experience the region's unique geography; it's a beloved pastime for families in southern Utah; and it's essential to the region's tourism industry.
Just last summer, I had the wonderful opportunity to see first-hand the region's trails, red rocks, and dunes. In fact, I rode in a dune buggy all across the famous Hurricane Sand Dunes with Washington County Sheriff, Cory Pulsipher.

Unfortunately, for too long, members of the OHV community in Washington County have had to deal with increasing uncertainty about long-term OHV access. Over time, long-revered paths and trails have become more restricted, or sometimes even closed. And locals are left to bear the burden.

That's why I introduced legislation that would give certainty to the OHV community by ensuring that the most treasured area for OHV access—and the only remaining open OHV area in the entire county—is preserved for future generations.

Most importantly, Chairman Lee, I am proud to say that this legislation reflects a truly collaborative effort. My proposal is the culmination of extensive discussions between diverse stakeholders in Washington County who collectively wish to preserve recreational access in the Hurricane Sand Dunes by designating it as an open OHV recreation area. This type of common ground exists because OHV access is more than just a priority for the County's recreational community. According to the County, events and riding in the Hurricane Sand Dunes also brings at least $3 million dollars to the local economy each year, and it constitutes a significant tourist attraction for the region that draws outdoor enthusiasts from across the country. I believe that open OHV access is one of the reasons that Washington County is one of the fastest growing areas of the United States.

But as I mentioned, even as the County grows at one of the highest rates in the country, access to open OHV areas is becoming increasingly limited. To protect recreational access in the Hurricane Sand Dunes now and in the future, I have worked hard to establish a solution that enjoys the support of the County, OHV groups, the regional water conservancy district, and others.

I appreciate the Committee giving fair consideration to this legislation and providing me the opportunity to speak with you here today. Areas where one can ride recreationally in Washington County have been diminishing over the last 30 years, and it is my hope that we can keep this area open for riding.

Senator LEE. Thank you very much, Senator Hatch, and thanks for telling us about the dune buggy. There is nothing more fun than exploring Utah's lands through a vehicle like that. Thanks for sharing that with us.

Senator HATCH. If you will excuse me, I am going to head back to Judiciary.

Senator LEE. Certainly, sir.

Mr. Ruhs.

STATEMENT OF JOHN RUHS, ACTING DEPUTY DIRECTOR FOR OPERATIONS, BUREAU OF LAND MANAGEMENT, U.S. DEPARTMENT OF THE INTERIOR

Mr. RUHS. Good morning, Chairman Lee and Chairman Murkowski, Ranking Member Wyden, and other members of the Subcommittee. Thank you for the opportunity to present testimony today.

I will briefly summarize the written statements concerning the 12 bills on today's agenda related to the Department of the Interior. In general, we support many of the goals of these bills and stand ready to work cooperatively with the Congress as they move forward.

S. 785 would provide to Alaska Native Vietnam-era veterans an opportunity to apply for an individual federal land allotment in Alaska. The Department supports the goals of the bill and looks forward to working with the sponsor on resolving technical issues.

S. 616 establishes a commercial concessions pilot program for lands covered by the Recreation and Public Purposes Act. The Department supports the bill's goals and would like to work with the sponsor on a few modifications, including language providing the BLM with broad recreation concessions authority.

S. 837 directs a land exchange between the BLM and the State of Utah and conveys certain BLM-managed lands to Washington County, Utah. The Department supports the bill's goals of enhancing outdoor recreation and consolidating land ownership. Our written testimony outlines the extensive process by which the agency would conduct an exchange were it not directed by Congress. Congress can determine alternative procedures that offer expediency and encompass the needs for local communities. The Department supports these efforts.

S. 357 would authorize a land exchange between the BLM and San Bernardino Valley Water Conservation District. The Department supports the bill and would like to work with the sponsor on a few modifications.

S. 436 allows for the exchange of certain federal coal leases, authorizes the substitution of Navajo Nation land selections and designates two wilderness areas in Northern New Mexico. The Department supports the bill's provisions that resolve coal leasing and tribal issues.

S. 32 establishes numerous conservation, recreation, and special management designations, among other provisions. The Department does not support the bill as currently written because many of the proposed designations and administrative provisions could ultimately decrease public access, limit outdoor recreation, and impede energy development.

S. 1548 establishes two national recreation areas, adds over 280 miles of Oregon rivers to the National Wild and Scenic Rivers System, and establishes new conservation designations on federal lands in Oregon. The Department does not support the bill as currently written because the proposed designations could decrease public access and impede timber management and harvest.

S. 90 requires the Secretary to commission a gradient boundary survey along the Red River, directed by the States of Texas and Oklahoma and in consultation with the tribes. The Department supports the goal of obtaining certainty about the location of federal land in relation to adjacent private land. We would like to work with the sponsor on modifications.

S. 467 directs the sale of BLM-managed lands in Mohave County, Arizona, that have been identified as potentially suitable for disposal. The Department supports the bill's goals and looks forward to working with the sponsor on a few modifications.

S. 468 aims to establish a procedure for resolving claims to rights-of-way under R.S. 2477. The Department supports the sponsor's goal of resolving this issue. We would like to work with the sponsors on modifications that we believe will streamline the proposed process.

S. 884 would allow mining claimants a chance to cure their failure to meet certain required filing deadlines and would give private relief to a small number of mining claimants. The Department supports the bill's goal of providing flexibility to small miners who have missed their filing deadlines and would welcome the opportunity to work with the sponsor on modifications.

Finally, the Department has submitted a statement for the record on S. 1230 which reinforces the state's primary authority over water allocation. The Department supports the goals of this bill and looks forward to working with the sponsor to ensure that both private property rights and public resources are protected.

Thank you for the opportunity to testify, and I will be happy to answer any questions you may have.

[The prepared statement of Mr. Ruhs follows:]

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests, & Mining
S. 32, California Desert Protection and Recreation Act
July 26, 2017

Thank you for the opportunity to testify on S. 32, the California Desert Protection and Recreation Act. This bill, which amends the California Desert Protection Act of 1994 (CDPA, Public Law 103-433), provides direction for the future management of Federal lands within the California Desert Conservation Area (CDCA).

The Department of the Interior (Department) recognizes the work of members of the California delegation to attempt to address a wide array of resource issues and management concerns in the California desert. Secretary Zinke is committed to implementing the America First Energy Plan, which is an "all-of-the-above" plan that includes oil and gas, coal, and renewable resources. Public lands in California are integral to the development of these important energy resources. In addition, Secretary Zinke, through Secretarial Order 3347, has pledged to expand access to America's public lands and increase hunting, fishing, and recreational opportunities nationwide. While we support the goals of S. 32 that align with these important priorities, we do not support the bill as currently written because many of its proposed designations and administrative provisions could ultimately decrease public access, limit outdoor recreation, and impede energy development.

The Department would like the opportunity to work with the sponsors and Subcommittee to address a number of concerns outlined in this statement. In particular, we note that the sponsors and Subcommittee may wish to consider a more geographically focused or county-specific approach for some of the designations proposed by S. 32. The bipartisan Washington County, Utah, and Owyhee County, Idaho, land management legislation advanced during the 110th Congress could serve as good examples. Finally, we defer to the Department of Agriculture and the Department of Defense regarding provisions in the bill concerning the lands and interests they administer.

Because of the complexity of this legislation and the importance of these issues to the Department, my statement will address each of the bill's provisions individually.

Background

The CDCA contains over 25 million acres and includes 16 million acres of public lands administered by the Department. It was singled out for special management in the Federal Land Policy and Management Act of 1976 (FLPMA). Section 601 of FLPMA recognized the unique location of the CDCA, which is adjacent to the major metropolitan areas of southern California and over 20 million residents. This location has always meant that the management of the CDCA must consider the public's desire for recreational activities, public access, energy

development, rights-of-way, conservation, and other important uses. The CDCA Plan of 1980 and its associated amendments were vast in their scale, ambitious in their goals, and designed to accommodate a variety of uses and users.

By the early 1990s, increased development pressures on the desert and new public awareness led many to believe that further measures were necessary to adequately conserve the special places of the California desert. After careful deliberation and an extensive public process, Congress in 1994 enacted the CDPA, which established Death Valley and Joshua Tree National Parks and the Mojave National Preserve, designated wilderness, and provided strong protections for traditional cultural uses of the area by various Tribes. The areas conserved by the CDPA serve as invaluable natural and recreational resources for the people of the California desert and the nearby Los Angeles metropolitan area.

Title I – California Desert Conservation & Recreation

Title I of S. 32 creates three new wilderness areas and expands two existing Wilderness Areas; expands wilderness in Death Valley National Park, and releases portions of six Wilderness Study Areas (WSAs). Title I also establishes the Vinagre Wash Special Management Area and Alabama Hills National Scenic Area; designates potential wilderness areas; expands three units of the National Park System; and establishes six National Off-Highway Vehicle (OHV) Recreation Areas, along with other miscellaneous provisions.

Wilderness

Section 1301 would designate the approximately 88,000-acre Avawatz Mountains Wilderness, the approximately 8,000-acre Great Falls Basin Wilderness, and the approximately 80,000-acre Soda Mountains Wilderness. In addition, this section would expand the existing Golden Valley Wilderness by approximately 1,300 acres, the Kingston Range Wilderness by approximately 53,000 acres, and Death Valley National Park Wilderness by approximately 92,000 acres. The Department supports Congressional action to resolve wilderness designation and WSA release issues on public lands across the West, and we welcome opportunities to further those efforts. Only Congress can determine whether to designate WSAs as wilderness or to release them for other multiple uses. We would like to work with Congress to achieve this important goal.

The Department notes that the lands proposed for wilderness designation by S. 32 generally serve as habitat for a diversity of plant and animal life and provide important opportunities for hiking, hunting, rock climbing, horseback riding, and other forms of outdoor recreation in the California desert. Pursuant to the priorities outlined by Secretary Zinke, we would like the opportunity to work with the sponsors and the Subcommittee to ensure that wilderness designation is the best mechanism for protecting these resources while restoring balance to other important uses. Alternative management approaches could conserve sensitive resources while still accommodating the full range of uses and activities permitted on other BLM-managed lands. If Congress opts to proceed with designation of these lands as wilderness, we would like to work on some management language modifications in section 1302 to ensure that the BLM and the NPS retain the flexibility to coordinate on cross-boundary issues.

A provision that the Department would recommend adding to Title I is the conversion of an approximately 1-acre area from designated wilderness to designated potential wilderness. This

area, known as the Mormon Peak Communication Area, serves as a major communications hub for the Death Valley National Park community. We would like to see it identified as potential wilderness until such time that a technological alternative becomes available to the present system.

Section 1303 proposes to release over 130,000 acres of BLM-managed public lands from WSA status, allowing these areas to be managed according to the existing BLM land use plans. As discussed above, we support this provision. These lands are small portions of WSAs that were not designated wilderness by this or previous legislation.

Vinagre Wash
Sections 1401 through 1404 create the approximately 82,000-acre Vinagre Wash Special Management Area (SMA) and would designate approximately 112 miles of trails for motorized recreation, horseback riding, mountain biking, and hiking. In recognition of the importance of the lands within the SMA to the Quechan Indian Nation and other Indian Tribes, section 1403 includes special protections of cultural resources and provides for a two-year study of those resources and related needs. Finally, section 1404 identifies four potential wilderness areas within the SMA. The Secretary is directed to preserve the character of the potential wilderness areas for eventual inclusion in the National Wilderness Preservation System, with limited specific exceptions for military uses. Designation would occur when the Secretary, in consultation with the Secretary of Defense, determines that all activities on these lands are compatible with the Wilderness Act of 1964.

The Department strongly supports efforts to facilitate and enhance recreational opportunities on America's public lands. We are also committed to the principle of tribal self-determination and efforts to strengthen tribal communities, including the preservation of cultural heritage. As with other lands proposed for wilderness designation by S. 32, however, we would like the opportunity to work with the sponsors and Subcommittee to ensure that the proposed potential wilderness designations are the most effective method of protecting sensitive resources while restoring balance to other important uses within the proposed SMA. We note that other management approaches could also conserve these resources while still allowing for the full range of uses and activities available on other BLM-managed lands, which may not be permitted under the Wilderness Act. The Department would also like to work with the sponsors on amendments to the language to ensure consistency with existing plans and laws, including boundary adjustments for manageability.

National Park System Additions
At Mojave National Preserve, 25 acres would be transferred from the BLM to the NPS. The NPS owns a maintenance facility situated on this parcel. No additional maintenance costs for the NPS would be incurred through the transfer.

At Joshua Tree National Park, approximately 2,900 acres of BLM land would be transferred to the NPS. An additional approximately 1,600 acres would be donated by the Mojave Desert Land Trust. These lands, which are contiguous to several places along the northern boundary of the park, would help provide a more cohesive, logical northern boundary and ensure the protection

of primary wildlife corridors that run through the park and adjoining public lands in the Mojave Desert.

The NPS would also be authorized to acquire and administer the Joshua Tree Visitor Center, currently located outside the park boundary and owned by the Joshua Tree National Park Association. The Association currently leases the structure to the NPS, and lack of permanent Federal property ownership prevents the park from making basic repairs or enhancements to the visitor center. Purchasing the structure would save the NPS annual rental expenses.

Although these land transfers would be beneficial to both NPS and BLM over the long term, we are concerned that a significant majority of the lands to be transferred to NPS under this bill has not been investigated for environmental conditions. These lands include areas that have been subject to mining, military operations, and other uses that may have created contamination necessitating cleanup. The Department recommends amending this section of the bill to ensure consistency with Departmental policy and the Comprehensive Environmental Response, Compensation, and Liability Act, and to require that prior to the transfer of any of the above-described lands to the NPS, they be fully investigated for any contamination in accordance with applicable environmental due diligence standards and that any contamination be remediated.

Off-Highway Vehicle Recreation Areas
Section 1601 designates six OHV Recreation Areas totaling about 200,000 acres on BLM-managed public lands. The Department is committed to expanding access to public lands and increasing recreation opportunities nationwide. As such, we support each of these designations as they would provide congressionally designated areas for this popular recreational activity in the California desert. The Department notes that the Dumont Dunes, El Mirage, Rasor, Spangler Hills, Stoddard Valley, and Johnson Valley OHV Recreation Areas would be consistent with BLM management goals for these areas. We would like to work with the sponsors and the Subcommittee on amendments to this section to address management discretion for commercial uses, consistency in naming, the requirement for additional planning activities, and timeframes.

Alabama Hills National Scenic Area
Sections 1701 through 1707 establish the Alabama Hills National Scenic Area, which would encompass approximately 19,000 acres of BLM-managed public lands and would be administered as a unit of the BLM's National Conservation Lands. These sections also provide for the transfer of about 40 acres of U.S. Forest Service land to the BLM; direct that 132 acres of Federal land be taken into trust for the benefit of the Lone Pine Paiute-Shoshone Reservation; and provides for an acquisition by a private landowner to resolve an ongoing trespass issue. The Alabama Hills contain unique geologic features that have attracted photographers, cinematographers, and recreationists for generations. The area provides stunning views of Mount Whitney and the Sierra Nevada Mountains and has spectacular natural arches, rolling hills, and vibrant wildflowers. The Alabama Hills also serve as a backdrop for iconic Hollywood movies and remains a popular location for commercial filming.

The Department's understanding is that Senators Feinstein and Harris, Congressman Cook, and their staffs have worked to assemble a diverse coalition of stakeholders, including Inyo County, the Lone Pine Chamber of Commerce, the Lone-Pine Paiute-Shoshone Tribe, local business

owners, and other key stakeholders, to reach consensus on the management and conservation of this area. The Department notes that each of the National Conservation Areas (NCAs) and similar designations established by Congress and managed by the BLM is unique. However, all of these designations have certain critical elements in common, including withdrawal from the public land, mining, and mineral leasing laws; limiting off-highway vehicles to roads and trails designated for their use; language that charges the Secretary of the Interior with allowing only those uses that further the purposes for which the area is established; and language ensuring that lands within such designations are managed at a higher level of conservation than the lands outside.

The Department could support the protection of the Alabama Hills as a part of the National Conservation Lands and the other provisions in this section, but we would like to work with the sponsors and Subcommittee on language to address management of utility rights-of-way, to ensure consistency with management of other units of the National Conservation Lands, and to address other minor technical issues.

Miscellaneous Provisions

Section 1801 provides for the transfer of approximately 1,000 acres of the Table Mountain Wilderness Study Area to the California Department of Parks and Recreation for administration as a unit of Anza-Borrego Desert State Park. This area contains 12 active mining claims, and the transfer would occur after claims are terminated. The Department does not necessarily object to this transfer, but we would like to work with the sponsors on language to ensure clarity of the transfer process and release language of the Wilderness Study Area status prior to transfer to California State Parks.

Section 1803 requires a study to assess the impacts of climate change on the CDCA within two years. The Department believes such study is unnecessary and notes that the analysis already conducted as part of the BLM's Desert Renewable Energy Conservation Plan largely met the requirements of this section.

Section 1804 establishes certain restrictions on the use of acquired or donated lands within the CDCA. The Department does not necessarily object to these restrictions, which we understand are related to various plans and agreements made under Federal and State laws, but we would like to work with the sponsors to ensure consistency with other existing agreements and requirements, to provide for discretion and public input, and to ensure technical accuracy. Section 1805 provides for access by members of Indian tribes and requires the Secretary to develop a Tribal Cultural Resources Management Plan for the Xan Kwatchan Trail network.

Section 1806 would transfer the Federal reversionary interest in certain lands and minerals to the Metropolitan Water District of Southern California. All costs associated with this conveyance would be the responsibility of the Metropolitan Water District. The BLM, as a matter of both policy and practice, and in accordance with FLPMA, generally requires receipt of fair market value for public lands or interests transferred out of public ownership. This serves to ensure that taxpayers are fairly compensated for the removal of public lands from Federal ownership. The Department supports the goal of conveying the reversionary interest outlined in this section. As with previous such proposals, we recommend amending the legislation to ensure the payment of

fair market value for the reversionary interest. However, the Department recognizes that there may be circumstances, as determined by Congress, in which the public benefits of a proposed transfer outweigh financial considerations. We would also like to work with the sponsors and Subcommittee on amendments to address issues of technical clarity.

Section 103 requires the Secretary to work with the California State Lands Commission to develop a process for exchange of State parcels within the new conservation designations. The Department has no objection to this process but would like to work with the sponsors on minor modifications to ensure it is consistent with existing authorities.

Section 104 amends the Wild and Scenic Rivers Act (16 U.S.C. 1274[a]) by adding segments of five rivers to the National Wild and Scenic River System. Three of these segments, the Amargosa River, Surprise Canyon Creek, and Whitewater River, cross public lands managed by the BLM and the NPS. All three of these are important riparian areas in the deserts of southern California and provide habitat for a number of threatened, endangered, and sensitive species. With that said, we would like the opportunity to work with the sponsors and the Subcommittee to ensure that wild and scenic river designation is the best mechanism for protecting such resources. Alternative management approaches could conserve sensitive resources while still accommodating the full range of uses and activities permitted on other BLM-managed lands. If Congress opts to add these segments to the National Wild and Scenic River System, we would like to work with the Subcommittee on technical issues, including correcting what we believe is an error in the legal description.

Section 105 contains a number of conforming amendments, some of which could significantly impact management of areas designated under the bill. We would like to work with the sponsors and the Subcommittee on the language regarding avoiding establishment of buffer zones. The section pertaining to Native Groundwater Supplies would preclude the Secretary from authorizing the use of any right-of-way or lease to extract, consume, export, transfer or distribute groundwater on certain BLM-managed public lands in quantities that collectively exceed the estimated perennial safe yield or annual recharge rate, as determined by the United States Geological Survey. The Department supports working landscapes across the West and is committed to keeping public lands healthy and productive. The Department would like to work with the sponsors and Subcommittee on amendments to this section to ensure that the BLM retains its ability to manage these public lands on the basis of multiple-use and sustained yield.

Title II – Development of Renewable Energy on Public Lands

Title II of S. 32 establishes a new process for disposition of revenues received for the development of wind or solar energy on BLM-administered lands throughout the West. Under this title, 25 percent of revenues would be distributed to States and 25 percent to Counties. For ten years, 15 percent of revenues would be used for the processing of renewable energy permits, while 35 percent would be deposited in a Renewable Energy Resource Conservation Fund (Fund). After ten years, the permit processing funds would also be deposited in the Fund. The Secretary would be permitted to make amounts in the Fund available to other Federal and State agencies for five purposes: 1) protection and restoration of important wildlife habitat and corridors and water resources; 2) conducting research with Universities on restoration and protection activities; 3) securing recreational access to Federal lands; 4) carrying out activities

authorized under the Land and Water Conservation Fund; and 5) establishing, operating, and maintaining a trans-State desert tortoise conservation center. The Secretary is also required to establish an Advisory Board to provide recommendations and guidance on the amount of funds expended from the Fund.

The Department notes that all revenues from solar and wind energy authorizations on public lands currently go to the U.S. Treasury. We do not support the diversion of solar and wind energy receipts and have concerns with the potential long-term costs associated such diversion. The Department would like to work with the sponsors and the Subcommittee to determine how best to achieve the overall goal of this title.

Additionally, under existing authorities and regulations, the BLM currently collects full cost recovery as costs are incurred throughout the wind and solar application process. Due to the difficulty in estimating the total cost for processing an application upfront, the Department recommends continuing its current cost recovery process.

Conclusion

The Department recognizes the work of members of the California delegation on S. 32 and supports certain goals of the bill that align with the Secretary's priorities of expanding access to and recreational opportunities on public lands. However, we do not support S. 32 as currently written. We would like to work with the sponsors and the Subcommittee on a number of substantive and technical modifications to the bill as it moves through the legislative process.

Statement of
John Ruhs,
Acting Deputy Director of Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
S. 90, Red River Gradient Boundary Survey Act

July 26, 2017

Thank you for the opportunity to present the views of the Department of the Interior on S. 90, the Red River Gradient Boundary Survey Act. S. 90 addresses a complex set of issues concerning the location of the southern boundary of the public domain along the Red River, which since the early 1800s has eluded final resolution. Enacting legislation would be a constructive approach toward long-term resolution of the Red River issues, and the Department supports the overall intent of the bill – obtaining certainty on the location of federal land in relation to adjacent private land.

Background

Along approximately 116 miles of its length, the southern bank of the Red River (as defined by the Supreme Court in 1923) forms the boundary between Federal and non-Federal lands. The vegetation line as described in the Red River Boundary Compact establishes the state line between Oklahoma and Texas. Because of treaties between the United States and Spain that followed the Louisiana Purchase, and the 1867 treaty between the U.S. and three American Indian Tribes that established the Kiowa, Comanche, and Apache (KCA) reservation, there remains a 116-mile strip of public domain land that lies between the medial line and the southern bank of the Red River, from the North Fork of the river east to the 98th Meridian. Under the Act of June 12, 1926, specific percentages of the fluid mineral development royalties on that public domain are deposited into a trust account for the KCA, with the remaining percentage going to the State of Oklahoma.

Identification of the exact boundaries of the public lands along the Red River is challenging for a multitude of reasons. The Department has attempted to survey portions of the area in order to identify the boundaries of certain Indian allotments.

S. 90, Red River Gradient Boundary Survey Act

S. 90 requires the Secretary of the Interior to commission and fund a gradient boundary survey along 116 miles of the Red River. The survey would be conducted by surveyors that are selected jointly by and operating under the joint direction of the Texas General Land Office and both the Attorney General of the State of Oklahoma and Oklahoma Commissioners of the Land Office, in consultation with each affected federally recognized Indian tribe. Surveyors will also survey individual parcels and identify property boundaries of private parties' property interests. Once

conducted, these surveys would be submitted for approval to the specified Texas and Oklahoma authorities. The surveys would not be submitted to the Secretary for approval. After receiving a notice from specified Texas and Oklahoma authorities of the approval of a survey related to an individual parcel, the Department would be required to identify and provide notice of the completed survey to each private owner of land adjacent to that parcel.

The Department would like to work with the sponsor and the Committee on a number of issues, including modifications to provide clarity on the resolution of private property claims. Under S. 90, the Federal contract for a survey of the South Bank Boundary of the Red River would include surveys of individual parcels along the river, which the States of Texas and Oklahoma, respectively, would approve or disapprove, in consultation with affected Federally recognized tribes. We encourage the sponsor to clarify whether the term "individual parcels" refers to private lands owned in either the State of Texas or the State of Oklahoma, as well as whether this term is intended to include parcels allotted to individual Indians. If it is intended to refer to the latter, there is some question as to whether the bill—assigning approval authority for the survey of individual parcels to the states of Texas and Oklahoma—is consistent with the Federal government's trust responsibilities toward these individual Indian allottees. In any event, if "individual parcels" is intended to encompass private landowners' parcels, we encourage the sponsor to include in the legislation an appropriate mechanism for affected private landowners to dispute surveys completed pursuant to the legislation.

The Department further notes that section 3(c) appears to associate completion of individual parcel surveys with a determination of which individuals own a parcel. If a private surveyor is expected to make determinations of individual ownership in addition to conducting surveys of individual parcels, the legislation and the Department's contract with the surveyor should state this clearly, and whether the survey authorized by this bill would supersede any prior surveys and associated deeds.

Especially because the legislation appears to provide for private surveyors making determinations about private property owners' parcels, the Department would like to work with the sponsor on modifications to ensure notification to landowners by an appropriate agency about these determinations. Under section 3(c)(2), within 30 days after receiving a notice of individual parcel approval from the Texas or Oklahoma authorities, the Secretary of the Interior is required to provide notice of the approval to each landowner adjacent to the individual parcel. Because the Secretary of the Interior has no authority to survey privately owned lands that are not coincident with a Federal boundary, the Department has no records of private land ownership in Texas. The Texas General Land Office and the Oklahoma Commissioners of the Land Office have all the information needed to identify private owners of land adjacent to any particular parcel. It may be more appropriate for those offices to notify private property owners in their respective states versus the Secretary of the Interior.

The survey required by S. 90 differs in a key respect from regular surveys that are conducted under contract with the Department. The S. 90 survey would be performed under the direction of the Texas General Land Office and both the Attorney General of the State of Oklahoma and Oklahoma Commissioners of the Land Office, in consultation with each affected Federally recognized Indian tribe; the Secretary of the Interior is explicitly excluded from directing and approving the survey results.

S. 90 divests the Department of the Interior of its role as surveyor of record to identify the boundaries of public lands, a role it has fulfilled since the Land Ordinance of 1785 and the Northwest Ordinance of 1787. The authority to identify the limits of Federal ownership—in this case, the boundary between Federal and private lands along the Red River—is a responsibility vested in the Secretary. The purpose is to assure that no clouds on title exist for lands conveyed out of Federal ownership. For the past two centuries, the Federal Government has surveyed public lands into townships and sections (Public Land Survey System), establishing legal records that formed the basis on which the government transferred public land to railroads, homesteaders, and others until 1976. The legal descriptions contained in these land records may also form the basis for modern title records and private real estate sales and purchases. The Department also conducts cadastral surveys that establish the boundary between Federal and private lands. The Department would like to work with the sponsor on modifications to ensure that the overall goals of the bill are achieved without divesting the Secretary of his responsibility to review and approve associated surveys.

The Department would also like to work with the sponsor on modifications to ensure consistency with the laws governing Federal contracts. S. 90 requires the Secretary to enter into a Federal contract with a contractor selected by third parties (the Texas General Land Office and the Oklahoma Commissioners of the Land Office, in consultation with the attorney general of the State of Oklahoma and each affected Federally recognized Indian tribe) to perform work that the third party directs and approves. Generally, standard Federal contracting law requires an agency to offer an open competition and to review the qualifications and capacities of the firms responding to the contractual solicitation. Moreover, it would be helpful to the Department if S. 90 clarified the dispute resolution procedures to be used in case a dispute arises between the contractor and the third parties, as well as clarifying which party bears responsibility for enforcing terms in the legislation; for example, the two-year time period for completing the surveys. The Department's role in evaluating whether the contractor fully performed the terms of the contract is also unclear.

Finally, section 4 provides that nothing in the Act modifies any interest of the States of Oklahoma or Texas, or of any Federally recognized Indian tribe, relating to land located north of the South Bank boundary line; modifies any land patented under the "Color of Title Act;" modifies or supersedes the Red River Boundary Compact enacted by the States of Oklahoma and Texas and consented to by Congress pursuant to P.L.106-288; creates or reinstates any Indian reservation or any portion of such a reservation; or alters any valid right of the State of Oklahoma or the Kiowa, Comanche, or Apache Indian tribes to the mineral interest trust fund established under the Act of June 12, 1926. The Department encourages the sponsor to add individual Indian allottees to the list of parties exempted from effect of this Act. Also, we understand that the Department of Justice would like to work with the subcommittee to address a constitutional concern with some of the text in the bill.

Conclusion

Thank you for the opportunity to present these views. I would be pleased to answer any questions.

Statement of
John Ruhs,
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
S. 357, Santa Ana River Wash Plan Land Exchange Act
July 26, 2017

Thank you for the opportunity to present the views of the Department of the Interior on S. 357, the Santa Ana River Wash Plan Land Exchange Act. S. 357 would direct the exchange of approximately 327 acres of public lands managed by the Bureau of Land Management (BLM) for approximately 310 acres of land managed by the San Bernardino Valley Water Conservation District (WCD) in San Bernardino County, California.

The Department supports the bill but would like to work with the sponsor and the Subcommittee on a few modifications. We appreciate Senator Feinstein's support of this land exchange, which will help consolidate ownership of lands, allow for infrastructure improvements, further mineral development, and contribute to habitat protection and conservation efforts in the Upper Santa Ana River Wash.

Background

For over twenty years, the BLM has been an active participant in coordinated land use planning and conservation efforts in the Upper Santa Ana River Wash (Wash Planning Area). This area is approximately one mile below the Seven Oaks Dam, near the City of Redlands, California, and involves a mix of both public and private land ownership.

The Wash Planning Area is regionally important for flood control, groundwater recharge, recreation, and habitat for threatened and endangered species. The area is also an important source for aggregate for concrete products and roadway construction materials. Under a Public Law from 1909 ("Act of February 20, 1909"), Congress set aside certain lands within this area for water recharge and excluded mining on BLM-managed lands. The diverse resource values within the region served as an impetus for the formation of a task force in 1993 to help coordinate land uses irrespective of land ownership boundaries. City and county officials, industry representatives, WCD officials, and the BLM were key members of the task force.

After 15 years of collaboration and engagement with stakeholders representing water, mining, flood control, wildlife, and municipal interests, the task force finalized a Regional Plan to coordinate the uses of the Wash Planning Area. Based on this Regional Plan, the users of the Wash Planning Area are developing a Habitat Conservation Plan (HCP) with the U.S. Fish and Wildlife Service. Taken together, these management strategies serve to guide land uses and activities while also improving the wildlife habitat in the Upper Santa Ana River Wash.

Public Land Exchanges

Under the Federal Land Policy Management Act of 1976 (FLPMA), the BLM's mission is to

sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. FLPMA provides the BLM with a clear multiple-use and sustained yield mandate that the agency implements through its land use planning process.

Among other purposes, land exchanges allow the BLM to acquire environmentally-sensitive lands while transferring public lands into non-Federal ownership for local needs and the consolidation of scattered tracts. The BLM conducts land exchanges pursuant to Section 206 of FLPMA, which provides the agency with the authority to undertake such exchanges, or when given specific direction by Congress. To be eligible for exchange under Section 206 of FLPMA, BLM-managed lands must have been identified as potentially available for disposal through the land use planning process. Extensive public involvement is critically important for such exchanges to be successful. The Department notes that the process of identifying lands as potentially available for exchange does not include the clearance of impediments to disposal or exchange, such as the presence of threatened and endangered species, cultural or historic resources, mining claims, oil and gas leases, rights-of-way, and grazing permits. Under FLPMA, this clearance must occur before the exchange can be completed.

S. 357

S. 357 would require within two years of the bill's enactment the exchange of approximately 327 acres of BLM-managed public lands for approximately 310 acres of WCD-administered private lands in San Bernardino County, California. The purpose of the exchange would be to transfer public lands to the WCD for economic development and to acquire environmentally sensitive private lands for consolidated management of public lands.

The land exchange would be subject to valid existing rights, appraisals would be conducted, and it would be completed pursuant to FLPMA Section 206. The WCD would be responsible for all costs associated with the exchange. If the value of the public lands proposed for exchange exceeds the value of the private lands, up to 59 additional acres of private lands may be added to the proposed exchange to equalize values. If the additional private lands are insufficient to equalize values, the WCD must make a cash equalization payment in accordance with the land exchange provisions of FLPMA or terminate the exchange. If the value of the private lands proposed for exchange exceeds the value of the public lands, up to an additional 90 acres of public lands may be added to the proposed exchange to equalize values. In the event that the additional public lands are insufficient to equalize values, the Secretary is not required to make a cash equalization payment to the WCD.

The bill would also exempt any public lands proposed for exchange to the WCD from the "Act of February 20, 1909." The private lands proposed for exchange to the BLM, however, would continue to be subject to the continued use, maintenance, operation, construction, relocation, or expansion of groundwater recharge facilities to the extent that such activities are not in conflict with the HCP. Finally, the bill revokes Secretarial Order 241 from November 11, 1929, which withdrew a portion of the public land for a transmission line that ultimately was not constructed.

Analysis

The Department supports the completion of land exchanges that consolidate ownership of scattered tracts of lands, thereby streamlining land management tasks and enhancing resources

protection and providing opportunities for resource development. In this particular exchange, the BLM would acquire quality habitat for the Federally-listed Santa Ana River woolly-star, slender-horned spineflower, coastal California gnatcatcher, and the San Bernardino kangaroo rat, while facilitating mineral and infrastructure development for local communities across the region.

We have a few concerns with the bill's provisions, however, and we would like the opportunity to work with the sponsor and Subcommittee to incorporate in the bill standard appraisal and equalization of values language, which has been used in many other successful legislated land exchanges. The Department is committed to continuing its adherence to the Uniform Appraisal Standards for Federal Land Acquisition and Uniform Standards of Professional Appraisal Practice and recommends the appraisal process be managed by DOI's Office of Valuation Services. The Department notes that the public lands proposed for exchange have not yet been fully analyzed under the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), or the FLPMA public interest determination. These review requirements provide for public engagement, opportunities to consider environmental and cultural impacts, and help ensure that unknown or unforeseen issues are not overlooked. Finally, we understand that the Department of Justice would like to work with the subcommittee to address a constitutional concern with some of the text in the bill.

Conclusion

Thank you for the opportunity to provide testimony on S. 357, the Santa Ana River Wash Plan Land Exchange Act. The Department supports the bill, but would like to work with the sponsor and the Subcommittee on a few modifications. I would be happy to answer any questions.

Statement of
John Ruhs,
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests, and Mining
S. 436, San Juan County Settlement Implementation Act
July 26, 2017

Thank you for the opportunity to present the views of the Department of the Interior (Department) on S. 436, which would authorize the Secretary of the Interior to retire a certain type of Federal coal lease rights – preference right lease applications (PRLA) – in exchange for issuance of equivalent value coal bidding rights which the PRLA holder could use elsewhere on Federal lands; authorize the Navajo Nation to substitute certain land selections; and designate wilderness areas in northern New Mexico.

The Department appreciates the work of Senators Heinrich and Udall to address concerns on previous versions of this legislation. While we support the bill's proposed resolution to long-standing issues concerning mineral development and tribal land selection, we believe that its wilderness designation components could be best achieved through standalone legislation. The Department notes that this type of approach could accommodate additional stakeholder perspectives concerning the most appropriate method of protecting the important resources and uses on these lands. We would also like to continue discussions with the sponsors and the Committee on a few remaining issues.

Background

Exchange of Coal Preference Right Lease Applications

Prior to 1976, the Secretary was authorized by the Mineral Leasing Act (MLA) to issue permits to prospect for coal on public lands in areas where no known coal deposits existed. If coal was discovered, the prospector could file a preference right lease application (PRLA). If commercial quantities of coal were demonstrated, the prospector was entitled to a "preference right lease," – a noncompetitive, exclusive right to mine coal on these public lands for an initial 20-year term.

The Federal Coal Leasing Amendments Act of 1976 repealed the Secretary's authority to issue prospecting permits and terminated the preference right leasing program for coal, subject to valid existing rights. However, coal prospecting permittees who had filed a PRLA prior to 1976 continue to be recognized as having valid existing rights that require adjudication by the BLM. In 1982 and 1987, the BLM promulgated regulations exclusively for processing these pre-1976 PRLAs.

To date, all coal PRLAs have been processed, except for eleven held by the Ark Land Company (Ark Land), covering approximately 21,000 acres in northern New Mexico. These PRLAs are within three miles of Chaco Culture National Historical Park and in the Ah-shi-sle-pah Wilderness Study Area (WSA), Fossil Forest Research Natural Area, and North Road and Ah-shi-sle-pah Road Areas of Critical Environmental Concern (ACECs). These areas are not an

ideal site for commercial development of the coal because they have cultural, archaeological, paleontological (dinosaur fossils), and primitive recreational significance. In the interest of protecting the important resources in the area, in 2012, after extensive investigation, litigation and negotiation, the BLM and Ark Land signed a settlement agreement that would seek to exchange the eleven PRLAs for an equal value in Federal bidding rights for Federal coal within the border of the State of Wyoming. S. 436 clarifies that the bidding rights would be applied to 50 percent of a bonus bid or a royalty payment. This language seeks to ensure that use of the Federal bidding rights will not interfere with payment of the State's share of bonus, rentals, or royalties that would be paid from Federal receipts to the State of Wyoming or any other State under the bid-sharing formula in the Mineral Leasing Act (30 U.S.C. 191).

Navajo-Hopi Land Settlement Act
As part of the Navajo-Hopi Land Settlement Act (P.L. 93-531), the Navajo Nation selected approximately 12,000 acres of lands which overlap the PRLAs and are within protected areas such as the Ah-shi-sle-pah WSA and south of the Bisti/De-Na-Zin Wilderness and the Ah-shi-sle-pah Road ACEC. These selections have not yet been completed due to the encumbrance of the PRLAs. The Navajo Nation has sought to "deselect" these lands and select others, but is unable to complete the action without further legislation. The new legislative authority in S. 436 would allow the Navajo Nation to finalize its land selections authorized under the Settlement Act.

Ah-Shi-Sle-Pah WSA & Bisti/ De-Na-Zin Wilderness
The Ah-Shi-Sle-Pah Wilderness Study Area (WSA), comprising 6,563-acres located about 40 miles south of Farmington, New Mexico, is rich in petrified wood, fossils, and exposed geologic formations and is popular for day hikers and photographers who enjoy its unique geologic history.

The Bisti/ De-Na-Zin Wilderness, an area of approximately 41,170-acres located 28 miles south of Farmington, New Mexico, offers some of the most unusual scenery found in the Four Corners Region. Natural sandstone weathering has created hoodoos – tall, thin spires of rock rising up out of the ground – pinnacles, cap rocks, and other unusual formations. This area recently received national attention following the discovery of two fossilized Pentaceratops dinosaur skeletons.

S. 436
Exchange of Coal Preference Right Lease Applications (Section 2)
S. 436 would authorize the Secretary to retire coal PRLAs by issuing bidding rights in exchange for relinquishment of the PRLAs. The bill defines a "bidding right" as an appropriate legal instrument that may be used in lieu of a monetary payment for 50 percent of a bonus bid in a coal sale under the MLA, or as monetary credit against 50 percent of a rental or royalty payment due under a Federal coal lease. Thus, a bidding right could be used in lieu of cash for part of a winning bonus bid in a subsequent coal lease sale, or used in lieu of cash for part of rental or royalty owed under a Federal coal lease.

S. 436 further provides for payment in cash of 50 percent of the amount of the bidding right used in the state where the new coal lease is issued – or where the royalty payment is made. The

revenue sharing obligation of the MLA to the state would be made from the cash payments received by the Secretary when bidding rights are exercised under this Act. Under S. 436, bidding rights would be fully transferrable to any other person and the bidding rights holder would have to notify the Secretary of the transfer. The bidding rights would terminate after seven years, unless the rights could not be exercised within the 7-year period under certain conditions outlined in the bill.

The Department supports the goal of S. 436 to provide legislative authority for a solution to the long-standing coal PRLA issue in northern New Mexico. However, the Administration is concerned about the likely costs associated with this legislation as drafted. Based on the terms of the legislation, and in the context of the Ark Land settlement agreement, it appears these costs could be substantial, which raises significant challenges for identifying suitable offsets. The BLM would like to work with the sponsors and the Committee on language regarding the timing of the valuation of the coal within the PRLAs, and ensure the Department's Office of Valuation Services and BLM will determine the fair market value of the resources consistent with standard valuation practices.

Navajo Nation Land Selection (Section 3)
Section 3 of S. 436 would cancel certain land selections made by the Navajo Nation pursuant to the Navajo-Hopi Land Settlement Act of 1974, and would authorize the Navajo Nation to make new selections of equal value to replace those canceled. S. 436 adds the Fossil Forest Outstanding Natural Area (formerly known as the Fossil Forest Research Natural Area) to the lands ineligible for selection.

The Department supports the bill's provisions to allow for new land selections by the Navajo Nation and providing for the deselection of the lands now encumbered by the PRLAs.
We would like to continue to work with the sponsors and Committee on language to ensure consistency with the original intent of the Navajo-Hopi Settlement Act.

Ah-Shi-Sle-Pah Designation & Bisti/De-Na-Zin Wilderness Expansion (Secs. 4 & 5)
Section 4 of S. 436 would designate approximately 7,250 acres of BLM-managed lands in northwestern New Mexico as the Ah-shi-sle-pah Wilderness, including nearly all of the existing Ah-shi-sle-pah WSA and releasing the remainder from WSA status. Section 5 of the bill would enlarge the existing Bisti/De-Na-Zin Wilderness by adding approximately 2,250 acres of BLM-managed lands directly south of the area.

The Department supports Congressional action to resolve wilderness designation and WSA release issues on public lands across the West, and we welcome opportunities to further those efforts. Only Congress can determine whether to designate WSAs as wilderness or to release them for other multiple uses. We stand ready to work cooperatively with Congress to achieve this goal.

We believe that the wilderness designations proposed by S. 436 could be best achieved through a standalone legislative proposal, similar to the approach taken in the bipartisan Washington County, Utah, and Owyhee County, Idaho, public lands legislation advanced during the 110th Congress. Secretary Zinke is focused on restoring full collaboration and coordination with local

communities and making the Department a better neighbor. We recognize the significant work of the sponsors on this proposal. As a general matter, the Department believes that wilderness decisions are best made as part of a locally driven process that incorporates the views of a wide range of stakeholders. In reaching consensus, stakeholders could ultimately determine that alternative management approaches are the best mechanism for protecting important resources of these areas while still accommodating the broad number of uses and activities permitted on other BLM-managed lands.

Conclusion

Thank you for this opportunity to present testimony on S. 436. The Department thanks the sponsors and the Committee for their dedication to this issue. We look forward to continuing to work with the sponsors to achieve these goals.

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests, and Mining
S. 467, Mohave County Federal Land Management Act
July 26, 2017

Thank you for inviting the Bureau of Land Management (BLM) to testify on S. 467, the Mohave County Federal Land Management Act. This bill provides for the disposal of BLM-managed land, at fair market value, in Mohave County, Arizona, that has been designated as potentially suitable for disposal by the Kingman Resource Area Resource Management Plan (RMP), Lake Havasu Field Office RMP, or the Arizona Strip Field Office RMP. The Department supports the goals of the bill but would like to work with the sponsor on modifications that would benefit Mohave County and the public.

Background

Mohave County, located in the northwestern corner of Arizona, is home to over 200,000 people. Approximately 71 percent of Mohave County is in federal ownership with the BLM managing over 4.8 million acres for a wide range of uses, including mineral development, livestock grazing, and recreation. Currently the three BLM RMPs (Kingman Resource Area, Lake Havasu Field Office, and the Arizona Strip Field Office) in Mohave County have identified over 80,000 acres of lands potentially suitable for disposal.

Public Land Sales

It should be generally noted that the Secretary of the Interior (Secretary) is staunchly opposed to the wide-scale sale or transfer of federal lands. He firmly holds that our treasured public lands are to be maintained and preserved according to the inscription on the Yellowstone National Park Arch that reads "for the benefit and enjoyment of the people." That said, the Secretary is interested in working with Congress on proposals of this nature in an effort to preserve access and recreation for future generations.

In 1976, with the passage of the Federal Land Policy and Management Act (FLPMA), Congress directed the BLM to retain management of most public lands, thereby reducing the acreage that had been available for disposal in earlier years. Under FLPMA, the BLM's mission is to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. FLPMA also provides the BLM with a clear multiple-use and sustained yield mandate that the agency implements through its land use planning process.

Public land sales remain a component of the BLM's land management strategy when such sales are in the public interest and consistent with publicly-approved land use plans. The primary land sale authority of the BLM is found in Section 203 of FLPMA. Land sales conducted under FLPMA occur at the discretion of the Secretary and are made at fair market value in accordance with Federal law. Sales are generally conducted under competitive bidding procedures to ensure

a fair return to the American taxpayer. In such cases, sales are widely advertised through public notices, media announcements, and on appropriate BLM websites.

The Department also acknowledges that the process of identifying lands as potentially suitable for disposal through sale or exchange does not include the review of potential impacts to important existing uses and resources, such as the presence of mining claims, oil and gas leases, rights-of-way, threatened and endangered species, cultural or historic resources, and grazing permits. Under FLPMA, this review must occur before a disposal action can be completed. The BLM's work contributes significantly to the economic and financial health of the country and the states where BLM-managed lands and resources are found. In Fiscal Year 2015, activities associated with BLM-managed lands and minerals contributed an estimated $88 billion to the Nation's economic output, supporting nearly 374,000 jobs. During the same period in Arizona, the BLM's management of public lands supported more than 5,000 jobs and had an overall economic impact of an estimated $430 million. Further, while the BLM receives just over $1.0 billion in annual discretionary appropriations to support programs nationwide, this work has contributed to the collection and distribution of more than $5 billion to the U.S. Treasury and to State and local governments in recent years.

S. 467

S. 467 directs the Secretary to conduct the sale of lands that have been identified as potentially suitable for disposal by the BLM in Mohave County, Arizona. The bill directs the Secretary to jointly select land parcels with Mohave County and sell the selected parcels through a competitive bidding process. The competitive bidding process will be for not less than fair market value based on an appraisal and adjoining land owners will be offered first option to match the highest bid. The Department supports this process and is committed to continuing its adherence to the Uniform Appraisal Standards for Federal Land Acquisition and Uniform Standards of Professional Appraisal Practice and recommends that the bill be modified to clarify that the appraisal process will be managed by DOI's Office of Valuation Services.

Once the land has been jointly selected by the Secretary and Mohave County, the bill withdraws the selected lands from location and entry under the mining laws and from operation of the mineral leasing and geothermal leasing laws until it is sold or two years have passed since the selected parcels were offered for sale. The withdrawals are subject to valid existing rights. The Department supports the temporary withdrawal of the land to be sold, but notes that the administrative process for land sales often exceeds two years and may be particularly challenging in this case because there are currently over 100,000 mining claims in Mohave County. As such, we have concerns with the duration of the withdrawal provision in this bill and would like the opportunity to work with the sponsor and the Subcommittee on technical modifications to address this issue.

In addition, the Department notes that the public lands proposed for sale have not yet been analyzed under the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), or the FLPMA public interest determination. These review requirements provide for public engagement, opportunities to consider environmental and cultural impacts, and will help ensure that unknown or unforeseen issues are not overlooked.

Finally, the majority of the proceeds from the land sales will go to the Treasury for deficit reduction. The Secretary is allowed to keep up to 20 percent, after consulting with Mohave County, to reimburse the administrative costs of preparing the sales. The Department appreciates the ability to retain sale proceeds for the purposes of reimbursement, but would like to work with the sponsor on language that would provide greater flexibility.

One avenue that Congress could consider would be the reauthorization of the Federal Land Transaction Facilitation Act (FLTFA), which provided the BLM with an important tool to facilitate land tenure adjustments. FLTFA expired in 2011. Reauthorization would allow the BLM to sell lands identified as potentially suitable for disposal in recent land use plans, and then use the proceeds from those sales to acquire other lands, including State trust land inholdings, for the purpose of increasing public access, enhancing outdoor recreation like hunting and fishing, conserving wildlife habitat, protecting water quality, preserving historic and cultural resources, and other important benefits. Proceeds from FLTFA would also provide the BLM with a robust mechanism for funding administrative costs associated with the land sales envisioned by this bill. We support the reauthorization of FLTFA as requested in the FY 2018 President's Budget.

Conclusion

Thank you for this opportunity to present testimony on S. 467. The Department supports the goals of this bill and we look forward to continuing to work with the sponsor and the Subcommittee to address minor and technical modification as the bill moves through the legislative process.

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests, & Mining
S. 468, Historic Routes Preservation Act
July 26, 2017

Thank you for the opportunity to present testimony on S. 468, the Historic Routes Preservation Act, which aims to establish a procedure for resolving claims to rights-of-way (ROWs) under Revised Statute (R.S.) 2477. The Department of the Interior (Department) sincerely appreciates the sponsors' efforts to address a broad range of challenging management and resource issues associated with claimed R.S. 2477 ROWs. We support the sponsors' goal of achieving judicial and administrative efficiency for, and reducing the costs associated with, resolving these claims. We would like the opportunity to work with the sponsors on modifications to the bill to address several issues outlined in this statement and to provide technical assistance.

Background

R.S. 2477 was enacted as part of the Mining Law of 1866 to promote the settlement and development of the West. R.S. 2477 was the primary authority under which many existing State and county highways were constructed and operated over Federal lands and did not require notification to the United States because the roads were automatically conveyed as a matter of law once certain conditions were met. In 1976, Congress repealed R.S. 2477 through the passage of FLPMA as part of a national policy shift to retain public lands in Federal ownership unless disposal "will serve the national interest." The repeal of R.S. 2477 did not affect valid rights in existence when Congress passed FLPMA.

R.S. 2477 ROWs were self-executing, meaning that they could be established without any government approval or public recording of title. As a result, there is considerable uncertainty regarding the existence of R.S. 2477 ROWs that may have been established on public lands prior to the enactment of FLPMA. This uncertainty has resulted in substantial litigation between State and local governments, which generally claim title to R.S. 2477 ROWs, and the United States and Federal land management agencies, particularly the Bureau of Land Management (BLM), National Park Service (NPS), and the Forest Service.

Over the years, the Department has issued a number of policies concerning R.S. 2477 claims. These policies have attempted to: 1) identify administrative processes to accommodate or assess the validity of unadjudicated R.S. 2477 ROWs; 2) interpret the meaning of R.S. 2477 itself, particularly the words "construction," "highway," and "not reserved for public use;" and 3) to define the respective rights of the ROW holder and the land managing agency.

Despite such attempts to address the issues related to R.S. 2477, considerable uncertainty remains. This impacts State and County governments, which consider these ROWs as part of their transportation systems, and Federal land management agencies' ability to manage and

protect important natural and historic resource values underlying and adjacent to adjudicated and unadjudicated R.S. 2477 ROWs.

While R.S. 2477 is an issue in every State with Federal lands that were open to operation of the statute before 1976, Utah has been a focal point of litigation. Between 2005 and 2012, the State of Utah and 22 counties in Utah filed numerous lawsuits under the Quiet Title Act, seeking to quiet title to over 12,000 R.S. 2477 ROWs. All of the cases have been filed in Federal district court in Utah. The vast majority of these claimed ROWs are on BLM-managed lands, but at least 60 claims are pending within National Park units, including Canyonlands, Capitol Reef, and Zion National Parks, Dinosaur National Monument, and Glen Canyon National Recreation Area. To date, only two cases involving 16 claimed ROWs have been litigated through the appellate level – one involving the BLM and the other involving the NPS.

S. 468, Historic Routes Preservation Act

S. 468 aims to resolve claims to R.S. 2477 ROWs by setting a new filing deadline for claimants, establishing mandatory procedures for considering and acting on claims, and requiring Federal administrative action for final resolution of such claims. Under section 4 of the bill, all previous statutes of limitations regarding claimed R.S. 2477 ROWs would be waived, and any party asserting public acceptance of such a ROW would be permitted to file a claim with the Secretary for the relevant land management agency within 25 years after enactment. Claims not filed within 25 years would be considered to have been irrevocably abandoned, and individuals or entities involved in litigation to determine the validity of claimed R.S. 2477 ROWs before enactment would be prohibited from filing. In addition, section 4 of S. 468 requires claimants to provide appropriate notice within specified periods of time. While the circumstances of individual claims vary, section 4 as currently drafted is likely to provide more time for claimants to file claims for ROWs to be granted than is currently permitted under existing law.

Section 5 of the bill sets forth the type and number of particular forms of evidence needed for claimants to prove the validity of claimed R.S. 2477 ROWs, places the burden on the claimant prove an R.S. 2477 claim by a preponderance of the evidence, and details any relevant presumptions. If the claimant submits the evidence identified in section 5, then the claimant is presumed to have met the burden of proof and conclusively established that the R.S. 2477 ROW was publicly accepted. Under these circumstances, section 5 requires that the relevant Secretary relinquish all right, title, and interest to the ROW unless the Secretary determines that it had been previously abandoned by the claimant.

Sections 6 through 10 of S. 468 include various provisions regarding judicial review, other applicable law, extensions that may be made for deadlines in the bill, timeframes for completing any necessary policies, procedures, and any other actions necessary for implementation, and the repeal of an appropriations rider related to R.S. 2477.

The Department recognizes the significant work of Senators Flake, McCain, Heller, and Hatch and the Subcommittee to attempt to reach consensus on R.S. 2477, and we believe that S. 468 serves as a good starting point to resolve this challenging land management issue. As such, we would welcome the opportunity to work with the sponsors on several modifications to the bill

that we believe will streamline R.S. 2477 claim resolution and make implementation more effective.

First, the Department notes that the bill as currently drafted could result in impacts to Federal land resources managed by the BLM and other Department bureaus, including National Conservation Areas and similar designations, as well as Wilderness Study Areas (WSAs), which are pending final review and resolution by Congress, given the location of claimed R.S. 2477 ROWs in these areas. We would like to work with the sponsors and Subcommittee on language ensuring consistency, to the extent possible, with existing legislatively protected conservation designations.

Second, the Department is concerned that S. 468 as currently written could inadvertently increase rather than decrease agency workloads. For example, each claim would likely require a thorough review of the history and use of the ROW before 1976, including substantial records research and perhaps on-site inspections. This could be especially challenging if the Secretary were to receive a significant number of claims at once or over a short period. Depending on the volume of claims, administrative processing of R.S. 2477 ROWs by the BLM's State and Field Offices could also limit the BLM's ability to process other lands and realty applications, such as transmission lines, communication sites, leases, and conveyances, in a timely manner. The Department would like to work with the sponsors on language clarifying the terminology and definitions, ensuring that the BLM can continue to meet its other responsibilities under FLPMA and other laws, and providing the BLM and other Department bureaus with sufficient time to carry out the bill's provisions.

Conclusion

Thank you for the opportunity to provide testimony on S. 468, the Historic Routes Preservation Act. The Department is committed to safe and responsible development on public lands and understands the importance of maintaining transportation infrastructure that meets the needs of State and local governments, and we look forward to working with the Subcommittee and Congress on this important issue. I would be happy to answer your questions.

Statement of
John Ruhs,
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior,
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests, and Mining
S. 614, RPPA Commercial Recreation Concessions Pilot Program Act
July 26, 2017

Thank you for the opportunity to testify on S. 614, the RPPA Commercial Recreation Concessions Pilot Program Act. S. 614 would amend the Recreation and Public Purposes Act (R&PP Act) to require the Secretary of the Interior (Secretary) to establish a commercial recreation concessions pilot program for lands transferred or leased under the R&PP Act (R&PP Act lands, covered lands).

The Department of the Interior (Department) supports working with State and local governments to resolve challenging land use issues and enhance the use and enjoyment of America's public lands. We understand that allowing third party commercial recreation concessions on R&PP Act lands could help the Department meet this important objective. The Department supports the goal of S. 614, and would like to work with Senator Flake and the Subcommittee to address a number of issues raised in this testimony. In addition, we would like to work with the sponsor on language granting the BLM explicit recreation concessions authority, which would create jobs, benefit local economies and communities, and enhance recreational opportunities on all public lands, not just those associated with R&PP Act leases.

Background

The Bureau of Land Management (BLM) frequently exercises authority under the R&PP Act to help States, local communities, and nonprofit groups obtain lands at no or low cost for important, specified public purposes. Examples of public purposes allowed under the R&PP Act include establishment of parks, schools, hospitals and other health facilities, fire and law enforcement facilities, courthouses, social services facilities, and public works. Since the R&PP Act's passage in 1926, the BLM has transferred approximately 410,000 acres of public lands to qualifying entities in the form of over 1,600 R&PP Act patents. The BLM also currently manages over 630 R&PP Act leases totaling approximately 76,000 acres.

Because the R&PP Act allows for the transfer and lease of public lands at prices far below fair market value, the State, local, and nonprofit entities that receive the lands must agree to always use them for bona fide public purposes. This stipulation is the foundation of the R&PP Act, and it is the basis for a limitation imposed on for-profit activities on covered lands. Under longstanding BLM policy, any revenue collected by State and local governments or nonprofit organizations on lands leased or transferred under the R&PP Act must be used on those lands. This restriction prevents public lands obtained at little or no cost from being used for large-scale revenue generation without a fair return to the American taxpayer.

The BLM includes reversionary clauses in the transactions to enforce the terms of the original agreements that State and local governments and nonprofit organizations enter into upon applying for and receiving R&PP Act transfers and leases. These provisions help ensure R&PP Act lands will either be used for public purposes in perpetuity or revert to Federal management, in accordance with the R&PP Act. The BLM has addressed requests to eliminate the Federal reversionary interests in covered lands by replacing R&PP Act leases with a commercial lease at fair market value or by allowing an R&PP patentee an opportunity to purchase the Federal reversionary interest at fair market value. Fair market value in each case is determined by the uniform appraisal process managed by the Department's Office of Valuation Services.

S.614

S. 614 would amend the R&PP Act to require the Secretary to establish a commercial recreation concessions pilot program to cover R&PP Act lands. Under the pilot program, the Secretary would enter into agreements with one to 10 parties to whom R&PP Act lands have been patented or leased for the establishment of commercial recreation concessions on the covered lands. The agreements between the Secretary and these parties could last up to 20 years based on specific financing criteria, and they could be extended once for no longer than their original terms.

In addition, S. 614 would allow R&PP Act land holders who have such agreements with the Secretary to enter into subsequent agreements with third parties for the establishment of commercial recreation concessions pursuant to the initial secretarial agreements. The bill also includes language that would open covered lands to a broad array of agricultural, industrial, or commercial uses without being considered a change in use under the R&PP Act. Finally, S. 614 would allow revenue collected by the R&PP Act land holders pursuant to the commercial concessions to be spent without restriction.

Taken together, these provisions would permit public lands obtained for very little or no cost to be used for large-scale revenue generation by third party users without providing a fair return for the American taxpayer. The BLM, as a matter of both policy and practice, and in accordance with the Federal Land Policy and Management Act (FLPMA), generally requires receipt of fair market value for public lands or interests transferred out of public ownership. This serves to ensure that taxpayers are fairly compensated for the removal of public lands from Federal ownership. However, the Department recognizes that there may be circumstances, as determined by Congress, in which the public benefits of a proposed transfer outweigh financial considerations. If Congress opts to move forward with the pilot approach envisioned by S. 614, we recommend amendments to tailor the bill more closely to recreation concessions, align with the original goals of the R&PP Act, and ensure consistency with FLPMA and other Federal laws. In addition, we would like to work with the sponsor to clarify some other key aspects of the bill, including general selection criteria and how designated pilot programs should be distributed across rural and urban areas.

Finally, we would welcome the opportunity to work with the sponsor and Subcommittee to provide the BLM with explicit concessions authority as recommended by a March 30, 2015 Office of Inspector General report titled, "Review of Bureau of Land Management's Concessions Management Practices." The Department believes that providing such authority would further the bill's intended objectives and would enable the BLM to manage recreation

concessions in a manner consist with the Department's other bureaus, thereby increasing efficiency and effectiveness of the agency's visitor facilities and services while also expanding access and recreational opportunities. This authority would also provide the BLM with a longer-term solution that would create jobs and benefit small businesses, local economies and communities, and the recreating public on all of America's public lands, not just those associated with R&PP Act leases. The Department would welcome the opportunity to work with Senator Flake and the Subcommittee on drafting concessions authority language.

Conclusion

The Department appreciates the work of Senator Flake on S. 614 and recognizes the unique role that recreation concessions can play in enhancing the use and enjoyment of America's public lands. We have a number of substantive as well as minor and technical modifications to recommend, and we look forward to continuing to work with Congress to address these important issues as this bill moves through the legislative process.

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management, U.S. Department of the Interior
Senate Energy and Natural Resources Committee
Subcommittee on Public Lands, Forests and Mining
S.785 Alaska Native Veterans Land Allotment Equity Act

July 26, 2017

Thank you for the opportunity to present the views of the Department of the Interior (Department) on S.785, the Alaska Native Veterans Land Allotment Equity Act. S.785 amends the 1971 Alaska Native Claims Settlement Act (ANCSA) to allow any Alaska Native veteran (or heir) who served during the period of August 5, 1964, through May 7, 1975, who has not yet received a Native allotment under the 1906 Allotment Act, to apply for an allotment of up to 160 acres of Federal land.

The Department supports equitable treatment of Alaska Natives and Alaska Native Veterans in the Alaska Land Conveyance program. We appreciate the sponsor's continuing interest in extending to Vietnam-era Alaska Native Veterans opportunities to apply for an individual allotment in recognition of their service to our country. The Department supports the goals of S. 785 and looks forward to working with the sponsor and the Committee to provide technical edits to further enhance this legislation and offer timely and efficient resolution of longstanding Native allotment processes.

Background

Several laws govern disposition of lands in Alaska. The Alaska Statehood Act and ANCSA provide for conveyance of broad swaths of land to the State and to Native Corporations. Land transfers to individual Alaska Natives were first authorized by the Alaska Native Allotment Act of 1906. The Allotment Act, as amended, authorized the Secretary of the Interior to convey up to 160 acres of "vacant, unappropriated, and unreserved non-mineral" land to individual Alaska Natives who could prove as head of household "substantially continuous use and occupancy of that land for a period of five years." Over 10,000 Alaska Natives filed allotment applications before 1971.

ANCSA, enacted in 1971, included a provision repealing the 1906 Allotment Act but with a savings provision allowing the Department to finalize the approximately 15,000 individual allotment claims then pending before the Department. In 1981, Section 905 of the Alaska National Interest Lands Conservation Act (ANILCA) legislatively approved the vast majority of the pending Allotment Act applications.

As of this date, there remain pending approximately 272 applications under the 1906 Act, most of which will require the State of Alaska to voluntarily re-convey title to the United States government before a conveyance can be made to the individual allotment claimant. The BLM

has prioritized the completion of individual allotments, and to date has completed final patent to approximately 98 percent (over 13,100 parcels) of individual Native allotments.

Another act authorizing land transfers to individual Alaska Natives is the Alaska Native Vietnam Veterans Allotment Act of 1998 (P.L. 105-276). This Act authorized the Department to provide a new 18-month filing period, ending in January 2002, to qualifying Alaska Native Vietnam-era veterans who were unable to file a claim under the 1906 Allotment Act before its repeal in 1971 because they were on active military duty during the three years (1968 -1971) prior to repeal of the 1906 Act. Certificates for 255 allotments have been issued, and seven parcels remain pending.

Members of Congress concerned about the low number of Alaska Native Vietnam-era veterans obtaining allotments under the 1998 Act identified three obstacles to that goal: 1) Alaska Native Vietnam veterans were able to apply only for land that had been vacant, unappropriated, and unreserved; 2) the eligible service dates did not encompass the full term of Vietnam war (1964–1975); and 3) veterans were required to prove they had been using the allotment for which they applied in a substantially continuous and independent manner for five or more years.

In addition, concerns have been raised that the lack of available land nullifies the very purpose of granting Native Vietnam-era veterans an allotment benefit. A recurring congressional concern has been that there is virtually no land available for selection and allotment in southeast Alaska because such land is located within the Tongass National Forest or conservation units, or has been conveyed to the State of Alaska or ANCSA Native Corporations.

S. 785

S. 785 is intended to address the obstacles in the 1998 Act and the lack of land available for selection and allotments. The bill authorizes allotment of Federal lands to individual Alaska Native veterans of the Vietnam era. It amends ANCSA to allow any Alaska Native veteran (or heir) who served during the period of August 5, 1964, through May 7, 1975, who has not yet received a Native allotment for a full 160 acres under the 1906 Allotment Act, to apply for an allotment of up to 160 acres of Federal land. Lands available for selection under S. 785 are any vacant Federal land in the state of Alaska that is located outside of the Trans-Alaska Pipeline right-of-way, a unit of the National Park System, a National Preserve, or a National Monument. Available lands in S. 785 include wildlife refuges, national forests, wilderness areas, acquired lands, national defense withdrawn lands, and lands selected by, or already conveyed to, the State of Alaska or an Alaska Native Corporation. The Department would like to work with the sponsor to develop criteria for adjudication and for the determination of superior rights to lands in these categories.

S. 785 also authorizes compensatory acreage only for Native Corporations that voluntarily relinquish land selected in order to make such land available for Alaska Native Veteran allotments. There is no similar provision for State selections. The bill does not mention compensatory acreage for land re-conveyed by the State of Alaska. We would like to work with the sponsor to develop options to address the goals of this legislation while reducing the impact to established land patterns and minimizing delays in fulfilling entitlements in progress.

The bill requires the Secretary of the Interior to publish implementing regulations, after consultation with Alaska Native organizations, within one year of the enactment of S. 785. Within five years after the date of enactment, S. 785 requires the Secretary to approve and certify allotment applications filed under this Act. The legislation further requires the Secretary to contact, in coordination with Alaska Native organizations, each individual potentially affected by S. 785 to explain the process by which the person may apply for an allotment. The Secretary is also required to contact each person or entity that has an interest in land that is potentially adverse to the interest of an applicant with notice of how to contest the allotment. We would like to work with the sponsor to develop a timetable and outreach strategy that supports the entire process for Alaska Native Veterans to select and receive allotments.

Conclusion

The highest priority of the BLM's Alaska Land Transfer program is to fulfill existing statutory mandates by completing title transfer to individual Alaska Natives that includes equitable opportunities for Alaska Native Veterans, as well as to fulfill remaining entitlements under ANCSA and the Statehood Act. We welcome the opportunity to work with the sponsor and the Committee to address the technical issues raised in this testimony in order to enhance the legislation.

Thank you for the opportunity to testify. I would be glad to address any questions.

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
S. 837, Southern Utah Open OHV Areas Act
July 26, 2017

Thank you for the opportunity to present testimony on S. 837, the Southern Utah Open OHV Areas Act, which legislates an exchange between the Bureau of Land Management (BLM) and the State of Utah's School and Institutional Trust Lands Administration (SITLA) and provides for the conveyance, at no cost, of approximately 19,000 acres of BLM-managed lands to Washington County, Utah, and the Washington County Water Conservancy District (WCWCD).

As a matter of policy, the Department of the Interior supports the completion of land exchanges that further the public interest, consolidate ownership of scattered tracts of land to make them more manageable, and enhance resource protection. We also support working with States and local governments to resolve land tenure and land transfer issues that advance worthwhile public policy objectives. The Department is mindful that legislated land exchanges and transfers often promote varied public interest considerations; part of our role is to help inform Congress and the public about the tradeoffs associated with such proposals. The Department is committed to advancing the important public access and recreation goals outlined by Secretary Zinke in Secretarial Order 3347, *Conservation Stewardship and Outdoor Recreation.* As such, we support the sponsor's goals of enhancing outdoor recreation and consolidating land ownership and recommend a number of amendments to address several issues raised below, particularly the significant reduction in public lands open to cross-country motorized recreation.

Based on an initial analysis of the bill and its accompanying legislative map, the exact lands proposed for conveyance and exchange are unclear, as well as the extent to which the proposal meets the objectives of interested stakeholders. We would welcome the opportunity, in cooperation with the sponsor, to create a legislative map for the purposes of this bill that reflects land status data and delineates the proposed exchange and conveyances more clearly.

Background

Washington County, Utah, covers nearly 2,500 square miles, and has been among the fastest growing counties in the country. The population of Washington County increased by 52 percent between 2000 and 2010. Rapid population growth directly impacts public lands and poses management challenges for a variety of resources. For over 20 years, the BLM has worked closely with Washington County, the State of Utah, area Tribes, and Federal agency partners to manage sensitive resources in a way that prevents conflicts and facilitates continued growth.

Sand Mountain Special Recreation Management Area

In 1999, the BLM established the approximately 40,000-acre Sand Mountain Special Recreation Management Area (SRMA), located just east of the city of St. George, Utah. The goal of the

SRMA is to provide long-term stability and recreation opportunities for user groups such as the off-highway vehicle (OHV) community. As a result of increasing urbanization and land use restrictions, the OHV community had lost much of their traditional open use areas.

The SRMA hosts a variety of popular recreational activities, including casual OHV riding and competitive events, horseback riding, climbing, scenic driving and viewing, visiting historical and paleontological sites (such as Fort Pearce and the Warner Valley Dinosaur Track), and undeveloped camping. Approximately 21,000 acres of the SRMA are designated as the Sand Mountain Open OHV Area, which features sand dunes and slickrock that appeal to all types of motorized recreation users, including 4x4, ATV, UTV, and motorcycle enthusiasts. The Open OHV Area provides local residents and visitors an enjoyable recreation experience in close proximity to the five largest cities in Washington County, and more than a dozen very popular commercial and competitive motorized recreation events take place annually in the area.

Since 1999, dramatic population growth in Washington County has triggered demand for new water storage facilities, highways, energy transmission rights-of-way, and other land use authorizations on public lands within and adjacent to the SRMA. As a result of various legislated conveyances, transportation grants, and Recreation and Public Purposes Act (R&PP Act) leases, the overall size of the SRMA has decreased by approximately 6,000 acres.

Utah School and Institutional Trust Lands Administration

The Utah School and Institutional Trust Lands Administration (SITLA) manages approximately 3.4 million acres of land and 4.5 million acres of mineral estate within the State of Utah. Many of these parcels are interspersed with public lands managed by the BLM, including in the areas under consideration in this bill. Although State trust lands support select public institutions, trust lands are not public lands. State trust lands generate revenue to support designated State institutions, including public schools, hospitals, teaching colleges, and universities.

Public Land Exchanges

In 1976, with the passage of the Federal Land Policy and Management Act (FLPMA), Congress directed the BLM to retain management of most public lands, thereby reducing the acreage that had been available for disposal in earlier years. Under FLPMA, the BLM is directed to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations. FLPMA also sets forth the BLM's multiple-use mission, directing that public lands be managed for a variety of uses, such as conventional and renewable energy development, livestock grazing, conservation, mining, watershed protection, hunting, fishing, and other forms of recreation, and requires that various resources be managed on a sustained yield basis.

The BLM conducts land exchanges pursuant to Section 206 of FLPMA, or when given specific direction by Congress. Among other purposes, land exchanges consolidate ownership of scattered tracts for more efficient management, and allow the BLM to acquire environmentally sensitive areas while transferring public lands into non-Federal ownership for local needs. To be eligible for exchange under Section 206 of FLPMA, BLM-managed lands must have been identified as potentially available for disposal through the land use planning process. Extensive public involvement is critically important for such exchanges to be successful.

The Department notes that the process of identifying lands as potentially available for exchange does not include the review of potential impacts to important existing uses and resources, such as the presence of threatened and endangered species, cultural or historic resources, mining claims, oil and gas leases, rights-of-way, and grazing permits. Under FLPMA, this review must occur before a disposal action can be completed.

The BLM manages nearly 22.9 million acres of public lands within the State of Utah for a wide range of uses, including energy production, recreation, livestock grazing, and conservation. In the recent past, the BLM has completed three large-scale exchanges with the State of Utah at the direction of Congress through the Utah Recreational Land Exchange Act of 2009 (Public Law 111-53), the Utah West Desert Land Exchange Act of 2000 (Public Law 106-301), and the Utah Schools and Land Exchange Act of 1998 (Public Law 105-335). Through these exchanges, over 296,000 acres of Federal land were conveyed to the State of Utah, and the United States acquired over 596,000 acres from the State, based on equalization of appraised value or as otherwise directed by Congress. An additional exchange directed by the FY 2017 National Defense Authorization Act (Public Law 114-328) of approximately 98,000 acres of public lands for approximately 71,000 acres of State owned lands and approximately 14,000 of State owned mineral estate is currently in progress.

Public Purpose Conveyances

The BLM regularly leases and conveys lands to local governments and nonprofit entities for a variety of public purposes. These leases and conveyances are typically accomplished under the provisions of the Recreation and Public Purposes Act (R&PP Act) or through direction supplied by specific Acts of Congress. Such direction allows the BLM to help States, local communities, and nonprofit organizations obtain lands at nominal cost for important public purposes. The Department generally supports appropriate legislative conveyances at nominal cost if the lands are to be used for purposes consistent with the R&PP Act, if the lands are appropriate for disposal, and if the conveyances have reversionary clauses to enforce this requirement.

S. 837

Land Exchange (Section 3)

Section 3 of S. 837 would require the exchange of approximately 2,200 acres of State-owned land within the northern portion of the SRMA for approximately 1,500 acres of BLM-managed public lands within and adjacent to the southwestern portion of the SRMA. The purpose of these exchanges would be to consolidate ownership of isolated State parcels and to transfer public lands to the State for economic development.

Under the bill, the land exchanges would be completed subject to valid existing rights, and appraisals would be conducted. The Secretary of the Interior would be required to reimburse the State of Utah for 50 percent of the appraisal costs. If the value of the public lands proposed for exchange exceeds the value of the State lands, the value must be equalized through the addition or elimination of land or by the State making a cash payment to the United States. If the value of the State lands proposed for exchange exceeds the value of the public lands, the value must be equalized through the elimination of land or by the Secretary making a cash payment to the State.

The Department supports the completion of major land exchanges that consolidate ownership of scattered tracts of land, thereby easing BLM and State land management tasks. As detailed below, we have several concerns with the land exchange provisions in this bill. We would like the opportunity to work with the Subcommittee and the sponsor on amendments and other technical modifications to address these issues.

First, the public lands proposed for exchange with the State contain a number of important resources and uses, including portions of active BLM grazing allotments and very popular areas for cross-country OHV recreation access. The Department would like the opportunity to work with the Subcommittee and the sponsor on language and boundary modifications to ensure the protection of these resources and uses.

In addition, the Department notes that the public lands proposed for exchange have not yet been analyzed under the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), or the FLPMA public interest determination. These review requirements provide for public engagement, opportunities to consider environmental and cultural impacts, and help ensure that unknown or unforeseen issues are not overlooked.

The Department is also committed to continuing its adherence to the Uniform Appraisal Standards for Federal Land Acquisition and Uniform Standards of Professional Appraisal Practice and recommends the appraisal process be managed by the Department's Office of Valuation Services. The Office of Valuation Services provides credible, timely, and efficient valuation services to ensure public trust in Federal real property transactions.

Finally, based on an initial review of the bill and the legislative map, the exact lands proposed for exchange, including total acreages, are somewhat unclear. We would welcome the opportunity to create a legislative map for the purposes of this bill that reflects land status data and more clearly identifies which lands would be exchanged.

Conveyances to Washington County & the Washington County Water Conservancy District (Section 4)

Section 4(a) of the bill directs the BLM to convey at no cost approximately 19,000 acres of public lands within the SRMA to Washington County, Utah, for use as an open OHV riding area, subject to valid existing rights. Washington County is required to pay all survey costs and other administrative costs associated with the conveyance, and to release the United States from liability for any injury or damage that may arise from uses carried out on the land prior to the conveyance. Before this land is conveyed to Washington County, sections 4(g) and 4(i) of the bill require the BLM to issue rights-of-way for water and transmission infrastructure to the Washington County Water Conservancy District (WCWCD). Under section 4(h) of the bill, the BLM is also required to convey to the State or the WCWCD approximately 215 acres of public lands for the construction, operation, maintenance, and repair of the Hurricane Cliffs Afterbay water storage facility.

As discussed above, the Department has previously supported legislated, no-cost public purpose conveyances if they meet standards under the R&PP Act and are determined to be appropriate

for transfer out of Federal ownership. The Department notes that the lands to be conveyed under section 4(a) appear to include the entirety of the SRMA's Open OHV Area, which is popular with the public and has substantial recreation use. The BLM has invested more than $120,000 in recent years at this site to improve infrastructure (such as boundary and trail signage and restroom facilities), enhance road access, and support free public access for casual use. The Department is concerned that this section as currently drafted could result in the conveyed lands being used for purposes incompatible with cross-country OHV travel, including the construction of fire stations, municipal buildings, and other public facilities consistent with the R&PP Act. This could result in a significant reduction in the public lands available for this important recreational activity. In addition, the Department notes that this section could result in the State converting the conveyed lands area into a fee site, potentially limiting recreational access for members of the public.

Visitors to public lands enjoy countless types of outdoor adventure, and the BLM strives to provide unparalleled recreational experiences for the American people. The Department would like the opportunity to work with the sponsor and Subcommittee on language to improve the quality of outdoor recreation throughout the SRMA and to ensure that the Sand Mountain Open OHV Area in particular remains available to cross-country motorized recreation.

As with the exchange proposed in section 3 of the bill, it is unclear from the legislative map accompanying the bill exactly which lands are proposed for conveyance. We would welcome the opportunity to create a legislative map for the purposes of this bill that reflects land status data and more clearly identifies which lands would be conveyed. Finally, we understand that the Department of Justice would like to work with the Subcommittee to address a constitutional concern with some of the text in the bill.

Conclusion

Thank you for the opportunity to provide testimony on S. 837, the Southern Utah Open OHV Areas Act. The BLM is committed to supporting all types of outdoor recreation on America's public lands, and we look forward to working with the Subcommittee and Congress on this important issue. I would be happy to answer your questions.

Testimony of

John Ruhs
Acting Deputy Director
Bureau of Land Management
Department of the Interior
Senate Energy & Natural Resources Committee
Subcommittee on Public Lands, Forests, and Mining
S. 884, Small Miners Waiver Act
July 26, 2017

Thank you for the opportunity to testify today on S. 884. In communities across the country, hardrock mining provides jobs, supports a diverse and vital economy, and brings important commodities to market that are essential to maintaining a high quality of life for all Americans. The public lands are a significant source of these mineral resources, and mineral development is an important land use within the Bureau of Land Management's (BLM's) multiple-use mandate. The Department of the Interior (Department) greatly appreciates the work of Chairman Murkowski and the Subcommittee in support of environmentally-responsible mineral development from the nation's public lands.

S. 884 would require the BLM to allow mining claimants a chance to "cure" their failure to meet certain required filing deadlines. The bill would also give private relief to a small number of mining claimants whose mining claims have been deemed abandoned for failure to comply with applicable laws and regulations. The BLM appreciates the sponsor's work on this legislation and supports S. 884's goal of providing flexibility to small miners who have missed their filing deadlines. The BLM would welcome the opportunity to work with the sponsor and the Subcommittee on language to clarify the legislation and promote accountability.

Background

The Omnibus Budget Reconciliation Act of 1993 (maintenance fee statute) established an annual maintenance fee for unpatented mining claims, mill sites, and tunnel sites. This annual maintenance fee is currently set by regulation at $155 per lode mining claim or site and $155 per every 20 acres or portion thereof for a placer claim. The maintenance fee statute also gave the Secretary of the Interior (Secretary) the discretion to waive the annual maintenance fee for certain "small miners" – mining claimants who hold 10 or fewer claims or sites.

Following the enactment of the maintenance fee statute, the Department promulgated regulations that exercised the Secretary's discretion to allow the maintenance fee waiver for "small miners." These regulations state that in order to qualify for the waiver under the maintenance fee statute, the mining claimant must, among other things, file a maintenance fee waiver certification that certifies he and all related parties hold 10 or fewer mining claims or sites. Under the original regulations, the deadline for filing the maintenance fee waiver certification for the upcoming assessment year was August 31, which was the same day as the statutory deadline for filing annual maintenance fees. When Congress changed the statutory annual maintenance fee deadline to September 1, the Department changed the deadline for maintenance fee waiver certifications to also be September 1 for the coming assessment year. The Secretary's decision to make the regulatory deadline for filing maintenance fee waiver certifications the same as the statutory deadline for paying annual mining claim maintenance fees took into consideration the statutory constraint that maintenance fee

waivers could not legally or practically be sought any later than the deadline for the maintenance fee itself.

Unlike mining claimants who pay the annual maintenance fee, mining claimants who file maintenance fee waiver certifications are not exempt from the annual filing requirements in section 314 of the Federal Land Policy and Management Act (FLPMA). As such, mining claimants who file maintenance fee waivers certifications must also submit an annual filing – either an affidavit that they have done sufficient work on their claim in lieu of the maintenance fee, or a notice of intention to hold – on or before December 30, following the submission of the waiver and after the close of the assessment year for which a waiver was sought. Failure to submit either the waiver certification or the required filing under FLPMA results in forfeiture or abandonment of the mining claim by operation of law.

When Congress amended the maintenance fee statute in 1998 to change the filing deadline from August 31 to September 1, as noted above, it also amended the maintenance fee statute to allow mining claimants seeking a maintenance fee waiver to cure a "defective" waiver certification. The amendment required the BLM to give mining claimants filing timely "defective" maintenance fee waiver certifications notice of the defect and 60 days from the receipt of written notice to "cure" that defect or pay the annual maintenance fee due for the applicable assessment year. Failure of the mining claimant to cure the defect results in the forfeiture of the mining claim.

S.884

S.884 would amend the maintenance fee statute to allow mining claimants an opportunity to "cure" a defective maintenance fee waiver certification for any reason, including if the claimant failed to timely file the waiver. As under the current statute, mining claimants would have 60 days from the receipt of written notice to correct that defect or pay the applicable maintenance fee. The bill would also provide the same 60-day cure period for an untimely annual filing under section 314(a) of FLPMA. S.884 would also give private relief to certain mining claimants whose mining claims have been deemed abandoned for failure to comply with applicable laws and regulations. The BLM has concerns with the bill as written and would like to opportunity to work with the sponsor to better achieve the bill's goals.

Analysis

Altering Deadlines

The BLM generally supports the goals in Sec. 1(a) that would allow miners flexibility when filing the small miner fee waiver. As written, the BLM has concerns with the proposed legislation, as it would effectively eliminate the September 1 deadline in the maintenance fee statute as well as the annual filing deadlines in section 314(a) of FLPMA. Amending the maintenance fee statute and section 314 of FLPMA to make failure to timely file a curable defect would require the BLM to accept late filings after the deadline, no matter how late. This would shift the administrative review and notification to the BLM, increasing the cost of administering the mining law program. Further, it would enable a mining claimant to hold the mining claims or sites in suspense until the BLM is able to identify the deficiency and notify the mining claimant. This would effectively extend the applicable deadlines by removing any penalty for failing to comply in a timely manner. In an effort to limit the administrative burden, and hold miners accountable to timely pay the maintenance fee or file a timely maintenance fee waiver, the BLM would like to work with the sponsor on language to provide limitations on the number of times a small miner can have an untimely filing or perhaps institute a monetary fee associated with it.

Curing Defective Waivers
Under Sec. 1(a) of S. 884, if a mining claimant files either an untimely maintenance fee payment, an untimely maintenance fee waiver certification, or fails to make any filing at all, including a maintenance fee payment, the BLM would no longer be able to simply declare the mining claim or site void by operation of law, as authorized under the current maintenance fee statute since 1994. Rather, under this new provision, if any mining claimant fails to pay the annual maintenance fee or file a maintenance fee waiver certification by the deadline, the BLM would have to first determine whether each mining claimant qualifies as a "small miner" and, if so, would have to give notice and opportunity to cure – whether or not the mining claimant had any intention of paying the fee or filing a maintenance fee waiver certification. Moreover, because the BLM would have no way to determine if a mining claimant who qualified as a "small miner" had simply decided not to pay the fee or file the maintenance fee waiver certification and intentionally relinquish their mining claims, the BLM would have to send a "defect" notice to all such mining claimants who fail to either timely pay their maintenance fees or timely file a maintenance fee waiver certification and give them the opportunity to cure.

Similar considerations apply with respect to the provisions in S. 884 that allow mining claimants an opportunity to "cure" defective annual filings under section 314 of FLPMA. In addition, the amendments to FLPMA need clarification for other reasons. Section 1(a) of the proposed legislation purports to limit the opportunity to "cure" only to "an affidavit of annual labor" and only where "associated with the application." However, section 1(c) amends section 314 of FLPMA to extend the opportunity to "cure" to all required annual filings under section 314(a), regardless of whether it is an affidavit of annual assessment work, and regardless of whether it is associated with a maintenance fee waiver certification. These provisions appear to be potentially contradictory, and we would like the opportunity to work with the sponsor to clarify these requirements.

Covered Claimholder
The mining claims described under Section 1(b) belonged to several different claimants in Alaska. Section 1(b) would give the mining claimants the opportunity to "cure" the defects that led to their mining claims being declared abandoned and void, consistent with the amendments to the maintenance fee statute and section 314 of FLPMA that are proposed here.

The first "covered claimholder" (for mining claims AA023149, AA023163, AA047913, AA047914, AA047915, AA047916, AA047917, AA047918, and AA047919) is from Girdwood, Alaska. The mining claimant held nine mining claims located in the Chugach National Forest in southeastern Alaska. The BLM determined these mining claims to be statutorily abandoned in January 2005 when the mining claimant failed to file annual assessment work documents in accordance with FLPMA, and the Interior Board of Land Appeals (IBLA) subsequently upheld the BLM's decision to declare these mining claims null and void.

Finally, as the legislation is currently written, the BLM could not verify the remaining mining claim serial numbers identified in the bill. We would like to work with the sponsor to ensure that the bill text accurately identifies the mining claim serial numbers associated with the "covered claimholders" to whom this bill is seeking to provide relief. The BLM would welcome the opportunity to work with the sponsor on ways the Department can better serve the hardrock mining community.

Conclusion

Thank you again for the opportunity to testify on S. 884. I would be glad to answer your questions.

Statement of
John Ruhs
Acting Deputy Director for Operations
Bureau of Land Management
U.S. Department of the Interior
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, & Mining
S. 1548, Oregon Wildlands Act
July 26, 2017

Thank you for the opportunity to testify on S. 1548, the Oregon Wildlands Act. S. 1548 would establish two new national recreation areas on forest lands in western Oregon (Title I), add over 280 miles of Oregon rivers on lands administered by the Bureau of Land Management (BLM) and Forest Service to the National Wild and Scenic River System (Title II), and establish new conservation designations in western Oregon (Title III).

Secretary Zinke, through Secretarial Order 3347, has pledged to expand access to America's public lands and increase hunting, fishing, and recreational opportunities nationwide. In addition, Secretary Zinke is focused on restoring full collaboration and coordination with local communities and making the Department of the Interior (Department) a better neighbor. While the Department supports the goals of S. 1548 that align with these important priorities, we are concerned that the bill as currently written could ultimately decrease public access, limit outdoor recreational opportunities, and impede management and harvest of timber and other forest products. For these reasons, we cannot support the bill as written. We would like to work with the sponsors and the Subcommittee on a number of modifications to the bill to address these issues.

Background

The O&C Lands Act of 1937 placed 2.2 million checkerboard acres of Oregon and California Railroad and Coos Bay Wagon Road grant lands (the O&C lands) under the jurisdiction of the Department. Under the O&C Lands Act, the Department manages the O&C lands for "the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities." The Act also provides that the 18 O&C counties receive yearly payments equal to 50 or 75 percent of receipts from timber harvests on O&C lands in these counties. In addition to the O&C lands, the BLM manages approximately 212,000 acres of public domain forests and other acquired lands in western Oregon. These and other BLM-managed lands in western Oregon also provide outstanding recreational opportunities, with over 5 million people visiting each year to enjoy hiking, camping, hunting, and fishing.

Timber harvests and the associated payments to counties decreased significantly in the mid-1990s, after the historic highs experienced in the late 1980s. The decrease was caused, in part, by management measures seeking to address the conservation and recovery of threatened and

endangered species such as the northern spotted owl, coho salmon, and marbled murrelet. The Department manages the O&C lands, public domain forests, and other acquired lands under the 2016 western Oregon Resource Management Plans (2016 RMPs), along with guidance and management recommendations derived from the 2011 Northern Spotted Owl Recovery Plan and 2012 Final Critical Habitat Rule, as well as a number of court decisions.

The 2016 RMPs provide direction for the management of approximately 2.5 million acres of BLM-administered lands and offer outcomes for tourism, recreation, and timber harvest, while still maintaining protections for the northern spotted owl, listed fish species, and water resources. With full implementation of the 2016 RMPs, the BLM estimates that it will be able to offer for sale 278 million board feet (mmbf) per year in total timber volume. At the same time, the 2016 RMPs will help increase fire resiliency, develop habitat for northern spotted owl and other species, and protect listed fish species and water resources.

Oregon National Recreation Areas (Title I)

Title I of S. 1548 establishes the Rogue Canyon and Molalla National Recreation Areas on nearly 119,000 acres of intermixed O&C lands and public domain forests in western Oregon and provides guidance for the management of each area. Although the Department strongly supports efforts to increase access to and facilitate and enhance recreational opportunities on BLM-managed lands in western Oregon, we have concerns with the language of Title I and the impacts if it were to be implemented as written.

As discussed briefly above, the BLM's management of O&C lands and public domain forests is currently governed by a number of statutory requirements, including the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Clean Water Act, the O&C Lands Act of 1937, the Federal Land Policy and Management Act (FLPMA), and the relevant implementing regulations and plans. Under this framework, the BLM manages these lands for forest production in conformance with the principles of sustained yield and for other multiple uses.

The Department notes that the designations in this title involve O&C lands within the harvest land base established under the 2016 RMPs. We require additional time to conduct the detailed analysis necessary to evaluate the extent of potential impacts to timber harvest levels. As a result, the Department does not support this legislation as written.

We also believe that the management language for the proposed recreation areas is unclear and may impact existing commercial timber production activity that relies on rights-of-way held by adjacent private forest landowners and existing commercial recreational activity. Because of the size of the proposed areas, some of the bill's language may also limit access to existing trailheads and scenic opportunities. Therefore, the Department is concerned this language is inconsistent with Secretarial Order 3347 and Secretary Zinke's commitment to sustaining and creating recreational access.

Finally, we note that the maps for both of the proposed recreation areas were created for previous iterations of the legislation and may contain designations or other features unrelated to this bill. Consequently, the Department would like the opportunity to provide updated maps that display the proposed areas in greater detail using the latest data.

Additional Wild & Scenic River Designations & Technical Corrections (Title II)
Title II of S. 1548 would designate over 280 miles of Oregon rivers on lands managed by the BLM and Forest Service as recreational, scenic, or wild rivers under the Wild and Scenic Rivers Act. Title II also withdraws 16 miles of 6 Rogue River tributaries from land laws, mining laws, and mineral leasing laws and prohibits the Federal Energy Regulatory Commission (FERC) from licensing new water resource projects and associated facilities along these tributaries.

The Department believes that there may be alternative approaches for managing sensitive resources and would like to work with the sponsors and the Subcommittee to ensure the full range of uses and permitted activities continue on BLM-managed lands. As with the recreation areas proposed by Title I, the wild and scenic river designations involve O&C lands within the harvest land base established under the 2016 RMPs. We would need additional time to conduct the detailed analysis necessary to evaluate the extent of potential impacts to timber harvest levels. If Congress opts to add these segments to the National Wild and Scenic River System, we would like to work with the Subcommittee on clarifications and technical issues, including a correction to the amended language for the original Rogue River designation. We defer to the Department of Agriculture regarding wild and scenic river designations on lands managed by the Forest Service.

Wilderness Areas (Title III)
Title III of S. 1548 would add approximately 60,000 acres of BLM-managed public lands to the existing Wild Rogue Wilderness in southwestern Oregon. This title would also designate approximately 23,000 acres of Forest Service-managed lands and approximately 7,000 acres of BLM-managed public lands as the Devil's Staircase Wilderness, also in southwestern Oregon. The Department supports Congressional action to resolve wilderness designations across the West, and we welcome opportunities to further those efforts. Congress has the sole authority to designate lands to be managed permanently as wilderness, and we believe that such proposals should be considered as part of a locally driven process that incorporates the views of a wide range of stakeholders.

The Department notes that the lands proposed for wilderness designation by S. 1548 generally serve as habitat for a diversity of plant and animal life for forest-dependent species, including Pacific salmon, steelhead trout, and green sturgeon, and provide important opportunities for fishing, rafting and boat tours, and hiking and backpacking, and other forms of outdoor recreation in the forested mountains of western and southwestern Oregon.

Pursuant to the priorities outlined by Secretary Zinke, the Department believes there may be alternative approaches for managing these resources, and we would like the opportunity to work

with the sponsors and the Subcommittee to determine if wilderness designation is the best mechanism for managing these important resources and uses. If Congress opts to proceed with designation of these lands as wilderness, we would like to work with the sponsors to ensure that the bill language is consistent with how the BLM manages other congressionally-designated Wilderness Areas. We defer to the Department of Agriculture regarding wilderness designations on lands managed by the Forest Service.

As with the proposed recreation areas and wild and scenic river designations, the wilderness designations outlined in this title involve O&C lands within the harvest land base established under the 2016 RMPs. We would need additional time to conduct the detailed analysis necessary to evaluate the extent of potential impacts to timber harvest levels. In addition, the Department notes that the maps for each of the proposed wilderness areas were created for previous legislation and may not reflect current land status data. For clarity, we would like the opportunity to provide updated maps of the proposed designations.

Finally, the Department has no objection to the transfer of administrative jurisdiction of 49 acres to the Forest Service, which is an isolated parcel with limited road access and is not included in future BLM timber sale plans.

Conclusion

The Department is committed to increasing public access, expanding outdoor recreational opportunities, and increasing management and harvest of timber and other forest products. Therefore, the Department cannot support S. 1548 as written. We would be interested in working with the sponsors and the Subcommittee to address the specific concerns noted in our testimony with regard to the bill as drafted to accomplish our shared multiple use goals for BLM-managed lands.

Statement for the Record
U.S. Department of the Interior
Before the

Public Lands, Forests and Minding Subcommittee
Committee on Energy and Natural Resources
U.S. Senate

S. 1230, the Water Rights Protection Act of 2017

July 26, 2017

Thank you for providing the Department of the Interior with the opportunity to present our views on S. 1230, the Water Rights Protection Act of 2017. S. 1230 aims to prohibit the federal land management agencies from requiring the transfer of water rights recognized under state law directly to the United States as a condition of permit issuance or renewal. The Department supports the goals of S. 1230, and looks forward to working with the Committee to ensure the bill is calibrated to appropriately balance privately held water rights allocated under state law with the federal government's interest in managing public lands in the best interests of the American people.

Background

Any understanding of the settlement of the western United States would be incomplete without a discussion involving the role of water. Settlers of the West were fueled by the pursuit of economic advancement and stability, generally electing to settle along the rivers of the West in order to access trade and water supplies for farming, ranching, and use within the home. The federal government encouraged western expansion throughout the early 19th century through various laws and policies. For instance, soldiers were promised lands in return for enlisting in the American army during the War of 1812. Congress provided land grants and appropriated funding for the transcontinental railroad, which further consolidated the U.S. hold on the West. Under the Homestead Act of 1862, Congress authorized individuals to acquire title to 160 acres of public land. The Mining Act of 1866, the Desert Land Act of 1877, the Reclamation Act of 1902, among others all sought to encourage the development of the West.

Federal policy encouraging the settlement of the West, however, came at a price. Our Nation still grapples with the harm caused to our Nation's Native American population. The impact of many of these policies on Native Americans was profound and permanent. In terms of the conflict surrounding the allocation of water resources in the West, many of the seeds of this conflict, to both Indians and non-Indians, were planted during the rapid western expansion of the 19th century.

As our Nation struggled with the appropriate role of the federal government in western expansion, either by law or through investment in water infrastructure, western settlers could not depend upon the federal government to provide a system for water allocation. Rather, settlers developed their own customs, laws, and judicial interpretations to administer the allocation of water supplies. Settlers acquired water rights through the simple system of "first in time, first in right," whereby the individual who first appropriates water and puts it to beneficial use acquires a vested right to continue to divert and use that quantity. Traditional beneficial uses included irrigated agriculture, mining, stock watering, domestic uses, and power production. This concept later became memorialized by states as they entered the Union, and this system of "prior appropriation" remains largely intact in every state west of the 100th Meridian.

In the 20th Century, as our Nation's population continued to grow in the West, state-acquired water rights holders and the federal government began to increasingly collide. While Congress regularly deferred to the states in their authority to allocate water rights, federal courts also upheld the federal government's authority to reserve certain waters and exempt them from appropriation under state laws.[1] The conflict between state-acquired water rights holders and the federal government continued as Congress granted public land management agencies additional authorities to manage public lands or regulate activities. Legislation such as the Federal Land Policy Management Act, National Environmental Policy Act, Clean Water Act, and the Endangered Species Act often set regulatory limits on the exercise of state-acquired water rights. Now that we are over 168 years into the existence of our Department, this conflict remains real, and often acute, in parts of the West.

The Department of the Interior now manages 492 dams and operates 338 reservoirs with a total storage capacity of 245 million acre-feet of water, serving 31 million people. Interior manages more than 530 million acres of surface land, 409 units of the national park system, and 566 national wildlife refuges. Interior upholds the Federal trust responsibility to Indian Tribes and maintains relationships with 567 federal recognized Tribes. These figures serve as a constant reminder of the importance of maintaining an appropriate balance between (1) the Department's mission to protect and manage the Nation's natural resources and cultural heritage, provide scientific and other information about those resources, and honor its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities; and (2) the Department's aim to ensure our activities and policies to not have an adversarial impact on the state and local communities we interact with on a daily basis. Getting this balance is essential when allocating finite water resources.

---

[1] *United States v. Rio Grande Dam & Irrig. Co.*, 174 U.S. 702 (1899), *United States v. Winans*, 198 U.S. 371 (1905), and *Winters v. United States*, 207 U.S. 564 (1908).

Water supply is essential to supporting our Nation's public lands, which provide Americans with the opportunity to hike, fish, camp, and enjoy the great outdoors. These same lands serve as a lifeblood to many communities, which rely on them to graze, harvest timber, mine, and provide our nation with critical energy.

That is why the Department's management of public lands and water resources in the West often intersect with the water rights administered by states. Despite the inevitable conflicts over the allocation of finite water resources in the arid West, compounded during times of drought and due to growing populations, the federal government should avoid aggravating these conflicts. We can be careful stewards of our Nation's public lands and water resources while respecting the water rights of our neighbors. The Secretary of the Interior has pledged as one of his first priorities to restore trust and work with rather than against local communities and states. The distrust, anger and even hatred against some federal management policies is real, and the Secretary views this issue as an opportunity to facilitate further dialogue, rather than serving as a deaf adversary. It is with that mindset that we turn to our views on S. 1230.

S. 1230

Broadly speaking, the bill re-enforces the state's primary authority over water allocation, in particular as it relates to establishing and recognizing rights to use water. The federal government owns a wide variety of water rights, whether obtained under state law or through federal reservation, and has a wide variety of responsibilities for managing those water sources, such as allocating the waters of the Colorado River through the Boulder Canyon Project Act or utilizing unreserved waters for federal purposes or in the aid of navigation. At the same time, the Department recognizes the goals of the bill to prohibit the Secretaries of the Interior and Agriculture from conditioning any permit, approval, license, lease, allotment, easement, right-of-way, or other land use or occupancy agreement (hereinafter "permit") on the transfer of a private party's state water right to the United States. S. 1230 would also prohibit the Secretaries of the Interior and Agriculture from requiring any water user to apply for or acquire water rights in the name of the United States under state law as a condition of the issuance, renewal, amendment, or extension of any permit for the use of public lands. Both provisions, included in Section 3 of the bill, aim to prevent the federal government from acquiring a water right under state law for which it would otherwise have to acquire for itself.

While the Department is not aware of any broad program or policy that requires an applicant to transfer or relinquish privately held water rights to the federal government as a condition of a permit for the use of public lands, we will be conducting further analysis to determine scenarios where this may have occurred. We would like to work with the sponsor and the Committee to ensure that Section 3 has no bearing on voluntary, mutually beneficial water-sharing or water-use agreements between the federal government and private water rights holders, such as rangeland improvements, conservation easements administered by the U.S. Fish and Wildlife Service, or

partnerships to allow the use of groundwater on public lands for recreational use. The Department supports the goals of this provision, and looks forward to working with the sponsor and Committee to make additional revisions to the bill to ensure that both private property rights and public resources are protected.

The Department looks forward to working with the sponsor and this Committee to ensure Section 3(3) of the bill does not conflict with existing statutory authority pertaining to the management of public lands, and to ensure federal public land managers are not prohibited from carrying out their congressionally mandated mission of managing the use of public lands when those public lands are used in conjunction with the exercise of state-acquired water rights. Additionally, the Department would like to ensure that Section 3(3) does not interfere or impact Indian water rights. We also understand the concern among some water rights holders that absent legislation, public land managers may have the ability to severely limit the use of a state acquired water right. We look forward to working with you to ensure the proper balance between these two co-equal interests.

Section 4 of S. 1230 requires the Secretary of Agriculture and Interior to recognize the long-standing authority of states to manage and allocate water resources, and to coordinate with states to ensure that federal actions are consistent with, and impose no greater restriction or regulatory requirement than applicable state water law allows for purposes recognized by state law. Section 4 also prohibits the Secretary of Agriculture and Interior from adversely affecting states' permitting for the beneficial use of water and adjudicating water rights, adversely affecting any definition established by a state with respect to the term ''beneficial use'', ''priority of water rights'', or ''terms of use", or asserting any connection between surface and groundwater that is inconsistent with a state's recognition of such connection.

The Department also notes that Section 4(2)(B) may limit public land manager's ability to rely upon the best available science to determine the hydrologic nexus between groundwater and surface water, which could have an adverse impact on public lands. We look forward to working with the sponsor and the Committee to ensure this provision does not harm groundwater-dependent resources on public lands.

The Department appreciates the savings clause in Section 5, which recognizes the importance of Bureau of Reclamation contracts, the Endangered Species Act, Federal Power Act, and state-acquired water rights owned by the United States. We particularly appreciate the recognition of the unique role of federally reserved Indian water rights, which will allow the Department to continue pursuing the settlement of Indian water rights disputes in order to break down barriers to social and economic programs for Tribes and help create conditions that improve water resources management by providing certainty as to the rights of all water users who are parties to the dispute. The Department also recommends subsections 5(a), 5(d), and 5(f) be amended to

delete the word "existing", in order to ensure existing and future Interior authorities and federal reserved water rights are protected by the savings clause.

The Department notes that Title VII of HR 23, the *Gaining Responsibility on Water Act of 2017*, which passed the House of Representatives on July 12th, addressed many of the elements we raised in our testimony today.

Conclusion

The Department recognizes the interest in re-enforcing the state's authority over water allocation. The Department also recognizes that the federal government retains the right and obligation to manage federal lands under the Constitution. This right and obligation includes the authority to both reserve water rights and mitigate against the impacts of the exercise of privately held water rights on public lands. Congress, on the other hand, is charged with directing the Executive Branch's implementation of those rights and obligations. As such, we look forward to working with you on this bill to affirm the Department's commitment to private water rights, while maintaining our responsibility to manage public lands for the benefit of all Americans.

Senator LEE. Thank you very much. Thanks to both of you for your testimony.

We will now start with five-minute rounds of questioning, alternating between Republicans and Democrats, and I will be going first. Mr. Casamassa, I will start with you.

I continue to be concerned about some of the mixed messages from the Forest Service when it comes to deference to state water authority. At a budget hearing last month, we heard Chief Tidwell say that the agency defers to state water law. And yet, in the same discussion he indicated that it was appropriate for the Forest Service to restrict certain water uses in order to align water management with federal land management plans.

Can you clarify what the Forest Service's position is on where the agency's jurisdiction ends and where the state's jurisdiction begins?

Mr. CASAMASSA. Thank you, Senator, good question.

We recognize that the states have primacy over water rights associated with the specific states and relative to the law that's passed and implemented in each specific state.

There is, in order for the Forest Service to ensure that we can maintain our multiple-use mandate, it is in our interest to ensure that the water that is used on National Forest System land could be maintained and stay on National Forest System land, as part of the overall multiple-use mandate.

Senator LEE. Thank you.

Now I want to ask a follow-up question that I will open up to both of you.

In addition to the conflict that sometimes arises between federal and state water jurisdiction, there is a long history of conflicts between federal land managers and private water users in the West. So I would ask each of you, in your view, what are some specific institutional changes or regulatory adjustments that could be made within your respective agencies to restore trust with western water users? We will start with you, Mr. Ruhs.

Mr. RUHS. Thank you, Mr. Chairman.

I think, in response to that, I have had a lot of opportunities to work in the field throughout my career at the Bureau of Land Management and I have found that over time most of the problems that we have had with conflicts over water or other issues can easily be resolved, not easily, excuse me, but when you sit down with people and you collaborate and you work together, you can normally find resolution.

And I think from the federal standpoint, we continually have to make sure that we understand the state water laws and we have to understand that we're following those laws correctly and that they apply to the Federal Government as well.

Also, at that same time we have to ensure that we are protecting the federal resources, that we are protecting those federal assets that we need to ensure include water rights and water for wildlife, et cetera.

But together, I think we can easily resolve any conflicts that come before us. And, I guess, we look forward to continuing to do that.

Senator LEE. Mr. Casamassa?

Mr. CASAMASSA. I certainly would agree with where John is coming from with respect to working out some issues associated with water disputes at the local level, collaborating with the various water users on their collection and conveyance system and where their rights are and where the points of diversion are with respect to how they want to manage their water, in conjunction with the state.

I do think that in some respects, perhaps, there are things that the Forest Service can do. I know that there are some issues associated with some of our policy that may need to be clarified in order to, again, as you have alluded to, Senator, that could build some additional trust to clarify points within our policies.

Senator LEE. Yes, I appreciate the sentiments that both of you have expressed. We are talking here about fairly broad generalizations. Are there any specific policy changes or specific procedures you think could be adopted?

Mr. CASAMASSA. Yes, Senator.

I think that there is reference to potentially some direction that was provided in letter form in the State of Utah and Southern Idaho and the State of Nevada that continues to, perhaps, erode the trust, or not build trust, associated with National Forest System lands. And I think that if we would take and rescind that letter while we have—it is just something that maybe we have to have an overaction to take care of that letter in order to build trust.

Senator LEE. Okay.

Mr. CASAMASSA. That would be one example.

Senator LEE. If that letter were to be formally rescinded—and is that going to happen?

Mr. CASAMASSA. That is something that if you have asked for an example of what we could do to establish or continually build trust, that certainly could be one of the things that we could do.

Senator LEE. Okay. Alright.

Thank you.

Senator Heinrich.

Senator HEINRICH. Thank you.

Mr. Ruhs, as you know, the issues that would be resolved by the San Juan County Settlement Implementation Act have been pending for some time. The mineral issues in this bill actually date back to 1964. I think that puts them at 53 years and still unresolved.

The Navajo Nation is still waiting for land that they were promised in 1974 as part of the Navajo-Hopi Settlement Act. That makes them a little more young and spry, only 43 issues, or 43 years unresolved.

The WSA issue has been unresolved now for 26 years. This is a bill that is supported by the company that owns the coal rights. It is supported by the Navajo Nation. It is supported by the County Commission.

In my view, these issues have been dragged out for a very long time and we have an opportunity to resolve them once and for all. Would the BLM prefer litigation to legislation as the pathway to resolving all of these issues?

Mr. RUHS. Senator, the BLM would not prefer litigation. We would certainly like to work together to resolve any concerns we have with the legislation.

Senator HEINRICH. Go ahead, sir.

Mr. RUHS. I was just going to follow up, sir, with the fact that we are in strong support of resolving the mineral claim issues as well as the native land selections. And we would like to work together to review and continue to look at the wilderness and WSA issues.

Senator HEINRICH. The challenge, Mr. Ruhs, is that all of these issues exist on the exact same land. That is why we have a challenge today.

We have a preference right lease application on Ah-Shi-Sle-Pah. We have a WSA on those same lands in Ah-Shi-Sle-Pah. And we have a Navajo selection. So saying we are going to take these things apart and not solve them all at once is, I think, a recipe for another few decades of not resolving these issues.

I think if we do not resolve these issues legislatively, the likely outcome of that is that we will see litigation. And they will be resolved with litigation, which would be unfortunate.

I think we have a situation here where we can keep the Navajo Nation whole, we can keep the coal company whole, and we can keep the wilderness whole. But if we do not do those three things together, I think the deal falls apart and that is why this legislation is so important.

Senator LEE. Thank you.

Senator Daines.

Senator DAINES. Thank you, Mr. Chairman.

Mr. Casamassa, thank you for being here today. Thank you for your testimony.

As I mentioned in my opening remarks, the views of the local community are very important in any land use decision.

Regarding the Yellowstone Gateway Protection Act, in your view, did this administrative withdrawal process begin with local support? And would you agree that the local community stands squarely behind a withdrawal?

Mr. CASAMASSA. Thank you, Senator.

I think that, yes, the local community indicated to a large degree that they were very much supportive of the mineral withdrawal.

And in addition to that it was—I think that has been confirmed through the comments that we have received since it has been noticed in the Federal Register, and the scoping has continued to come in from the withdrawal proposal. Yes.

Senator DAINES. What is the status of the environmental review on the administrative withdrawal?

Mr. CASAMASSA. That, at this time, Senator, we have worked through, again, the noticing of the withdrawal. We have solicited public comment. In the comment period, we have had one public meeting. And right now, we are distilling down all of the comments that we have received and shaping to the degree the environmental effects analysis associated with the withdrawal proposal, as well as, potentially, looking at some alternatives that could be derived from the public comment that we have received.

Senator DAINES. So, you have not yet completed your analysis?

Mr. CASAMASSA. No, no, not at this time. We have a two-year period that we are estimating that we would complete the analysis in.

Senator DAINES. Two years. So when do you expect a final decision?

Mr. CASAMASSA. Fall of 2018.

Senator DAINES. Okay. What will the environmental assessment cover?

Mr. CASAMASSA. Good question.

It is going to cover the mineral, the extent of the mineral body itself, the economics associated with the mining of that, the implications associated with that being withdrawn and what would be forgone in the event of the withdrawal, as well as all the resource facets associated with air, water, soil, wildlife, the vegetation, and the recreational opportunities associated with that particular area.

Senator DAINES. So the impact on the outdoor economy would also be factored into your calculus?

Mr. CASAMASSA. That is part of what we would look at with respect to the, I would say, the beneficial impacts to withdrawing that area from mineral entry.

Senator DAINES. Will it be based on sound science?

Mr. CASAMASSA. Absolutely. And I would add to that both, not only the resource science but the science associated with mineral development.

Senator DAINES. And when you say that it would analyze the economics of the mineral ore and physical anomalies of the ore body and other factors, hypothetically, could the analysis recommend that the Administration not move forward with the withdrawal?

Mr. CASAMASSA. That is always a potential that, you know, based on the compilation of impacts associated with this particular proposal that could inform the decision to not advance the withdrawal.

Senator DAINES. How about a partial withdrawal?

Mr. CASAMASSA. That is potentially part of what could be uncovered as part of the overall analysis.

Senator DAINES. As well as a complete withdrawal of all 30,000 acres?

Mr. CASAMASSA. That is correct.

Senator DAINES. Do you believe that fact and science-based environmental analysis should drive this process?

Mr. CASAMASSA. I think, certainly, fact and science-based analysis, data analysis and information should significantly inform the decision-making process.

Senator DAINES. This legislation withdraws mineral rights, subject to valid existing rights. If a claimant has valid rights within a withdrawal area, can a mine be developed?

Mr. CASAMASSA. Yes.

Senator DAINES. What challenges does a withdrawal create to developing those valid rights, if any?

Mr. CASAMASSA. In the event that the lands that are part of the withdrawal are actually withdrawn and they are adjacent to valid and existing rights, it limits the potential for the expansion of the development of a mine that goes beyond what is valid and existing as of this present time.

Senator DAINES. So if there is a private inholding where one is pursuing mineral development, surrounded by withdrawn federal minerals, how will the development of the mine on private land be impacted?

Mr. CASAMASSA. Well certainly it would limit the scope and scale of the ore body that could be mined.

Senator DAINES. Okay. Thank you.

Senator LEE. Senator Cortez Masto.

Senator CORTEZ MASTO. Thank you.

Welcome, welcome, gentlemen. It is good to see both of you.

Mr. Ruhs, welcome to Washington, DC. I look forward to working with you.

Let me follow up with my colleague, Senator Lee's, conversation on water rights. I really appreciate the questions and the conversation.

And let me ask, Mr.—is it Casamassa?

Mr. CASAMASSA. Yes, Senator.

Senator CORTEZ MASTO. My new favorite name, Casamassa.

Mr. CASAMASSA. Mine too.

[Laughter.]

Senator CORTEZ MASTO. Senate bill 1230, which is the Water Rights Protection Act—I did not hear, is this a bill that you support and if not, why?

Mr. CASAMASSA. Well certainly we recognize that the provisions associated with prohibiting the transfer or acquiring water rights in the name of the Federal Government or the Forest Service is something that this bill does and you know, we recognize that.

Senator CORTEZ MASTO. Is that a yes or a no? So, you do support it or you do not support it or you support it with changes or——

Mr. CASAMASSA. Well, we recognize that that's part of the bill. There are some changes associated with other language in the bill that we'd like to work with the bill sponsor and the Committee on.

Senator CORTEZ MASTO. Okay. Because I saw in your written testimony that one of the things that you mentioned, specifically, are sections that impair the Forest Service's ability to balance the many multiple uses of Forest Service land. Is that what you are talking about?

Mr. CASAMASSA. Yes, that's correct.

Senator CORTEZ MASTO. Can you be specific?

Mr. CASAMASSA. Well, you know, specifically the bill refers to title, if you will, of water rights as it relates to potential valid rights which are not perfected at this time that provides a water rights filer with the ability to be, to a degree, unencumbered by any kind of authorization when and if they would be on National Forest System lands.

Senator CORTEZ MASTO. Okay. So you are willing to work with everyone to try to address that issue?

Mr. CASAMASSA. Yes.

Senator CORTEZ MASTO. Thank you.

Let me jump real quick then to Senate bill 884 and let me ask this. This is the Small Miners Waiver Act. And just to verify, Mr. Ruhs, is this a bill that is supported by the BLM?

Mr. RUHS. Senator, the bill as written, excuse me. The Department supports the bill, although we would like to work with the

sponsor to make some modifications in it and just ensure the language meets the intent or the need that we have. But we do support the bill in general.

Senator CORTEZ MASTO. Thank you. Thank you because obviously, as you well know, Nevada is a mining state. And I do believe that miners should receive notice and an opportunity to cure defective claims. So we look forward to working with you as well.

And then finally, on Senate bill 468, which is the Historic Routes Preservation Act, and I am going to open this question up to both of you but let me start with Mr. Ruhs.

You may or may not know this, but NACo, our National Association of Counties, supports this bill and I believe Nye County and Lincoln County in Nevada also have an interest in this bill.

Could this bill help the counties of Nevada meet their transportation needs? Do you have an opinion on that?

Mr. RUHS. Senator, I believe that this bill, if we were able to work with the sponsors and to modify a few parts of it, would definitely help us resolve some of the issues that we have. I think it takes a good first step to getting us where we need to be, and I think that's probably the important thing.

Senator CORTEZ MASTO. Okay.

And could this legislation potentially result in the privatization of rights-of-way to the detriment of public lands?

Mr. RUHS. We believe that's why having that time working together with the Committee and with the sponsors to make sure we address some of those concerns, we could avoid having that happen.

Senator CORTEZ MASTO. Okay, I appreciate that.

And then finally, Mr. Casamassa, I believe in your written testimony you mentioned that there is a lack of staff with expertise in complex historical and legal reviews needed to evaluate these claims. Can you just elaborate a little bit more? This is with reference to Senate bill 468.

Mr. CASAMASSA. Yes, Senator. You know, the claims that are made under R.S. 2477 are related to the lands that were not reserved prior to the reservation. And on the National Forest System lands, most of those lands were reserved in 1905. Records associated with the, with, say a claim, have to be prior to 1905. There is no real repository of records. They need to be gathered up from various sources. Some even have to be authenticated by historians in order to ensure that there is a claim that could be valid prior to 1905. So that's an example of the largest of the tasks associated with making those claims prior to the reservation.

Senator CORTEZ MASTO. Thank you.

Thank you for your comments today. I look forward to working with both of you.

Senator LEE. Senator Gardner.

Senator GARDNER. Thank you, Mr. Chairman, and thank you to both of you for your service and testimony today.

Mr. Ruhs, I will start with you and a question about one of the bills before us, Senate bill 1230, broadly speaking.

I am proud to be a co-sponsor of the legislation, the Water Rights Protection Act, and I thank the Chairman for bringing this piece of legislation up for consideration today.

It is a very important bill for Colorado and I commend the leadership of my Colorado colleague, Scott Tipton, for leading this effort in the House of Representatives. The House version of the bill has now passed the House of Representatives, and so I want to commend Scott Tipton for the great work that he has done on this to protect Colorado and state water rights.

With Colorado being a headwater state for major river basins including the Platte, the Rio Grande, the South Platte, and the Colorado, it is essential that the water rights from each of these rivers not be put in question by federal regulatory overreach.

So in the concluding paragraph of your testimony today you state that you, Mr. Ruhs, recognize Congress' desire to reinforce state water rights in light of potential federal overreach.

While I recognize that you brought up some technical points and concerns about the legislation during your testimony, broadly speaking though, do you believe that the Water Rights Protection Act would further clarify and reinforce the principle that water rights should be decided at the state and local government level, if the bill were to be enacted?

Mr. RUHS. Senator, we support the goals of the bill, and we would like to work with the sponsors and the Committee on the language that is in it. We feel real comfortable with the House bill and the way it is worded and the way it presents itself. And so, we would like to work together to get to that point.

Senator GARDNER. Yes, sure.

But do you believe that it would reinforce the principle of the water rights, which would be decided at the state and local government level?

Mr. RUHS. Could you repeat that, sir?

Senator GARDNER. Do you think that the bill, broadly speaking, reinforces the principle that water rights should be decided at the state and local government levels?

Mr. RUHS. Yes, sir, and we support that.

Senator GARDNER. Thank you.

Mr. Casamassa, a question for you.

In my time across Colorado forests one concern I hear from sheriffs and county commissioners continues to be the issue of law enforcement in our national forests. There have been some concerns about illegal operations in various parts of Colorado's forests and we have seen an uptake in some vandalism, unfortunately, of both National Parks in Colorado and within the Forest Service.

And so, what can we do to help either give more tools to local management, local decision-makers, when it comes to law enforcement or is there something that we need to do from a resource or personnel perspective to focus more on law enforcement with the National Forest?

Mr. CASAMASSA. Yeah, thank you, Senator. And the idea of the increased use or the—there are increased uses that are occurring on all of the public lands, primarily in states with large-scale growth, like Colorado, particularly along the front range. There are concerns associated with illegal grows on the Pike and San Isabel National Forests where we find the most illegal grows in the state.

That said, you know, we are working in cooperation with local county sheriffs and the states to ensure that we can provide the ap-

propriate resources across this large, vast landscape. I know one of the things that we seem to be effective on is when we do work together and be able to target specific kinds of uses or abuses and then work in specific locations on those.

So, you know, right now based on the research that we have available, we are working, I think, in a somewhat efficient manner. Certainly there is always room for improvement but given the resources that are available, the resource demands that are being placed on the National Forests and the BLM lands and the national parks, there is just increased concerns associated with improper use.

Senator GARDNER. Let me ask you this, because when I hear these conversations about illegal grow operations and some of these activities that are taking place, I hear it from the sheriff's perspective and I hear it from the county commissioner's perspective. When you hear it from personnel within the Forest Service, where does it rank amidst their concerns? I mean, is this a—is it being blown out of proportion? Is it a legitimate problem? Is it something that we are not focusing enough on? How does it—are we getting the real story?

Mr. CASAMASSA. Well, and I think it is, certainly, a problem, not only from the standpoint of an illegal activity occurring on National Forests, but in the way that that illegal activity is happening. There is clearly a number of illegal chemicals that are found in the grows. There is water being syphoned off of areas that should not have that water being syphoned off to actually enhance the grows. There are booby traps. There are all sorts of illegal activities associated with grows that not only are illegal, but they do have a, there is a concern over people stumbling across the grows while people, while the illegal use is occurring that there is a real concern there, not only from the standpoint of public health and safety, but the long-term impacts of all of the materials that are left at these sites.

Senator GARDNER. And if you do not mind, Mr. Chairman, if I could just ask one follow-up?

Are these primarily, you know, Ma and Pa criminal type of activities or are they more cartel-driven or organized-crime-type-driven activities?

Mr. CASAMASSA. It is my understanding that, you know, it runs, there is a full range of, you know, the complexity and the sophistication of the grows that are on all the public lands.

Senator GARDNER. Thank you.

Mr. CASAMASSA. Sure.

Senator LEE. Senator Wyden.

Senator WYDEN. Thank you, Mr. Chairman, and thank you for holding this hearing.

I want to apologize to all our guests because I am involved in managing the health care bill on the Floor.

I would also like to note that, having served on this Committee for around 20 years now, this is the hottest it has ever been in this Committee room. So I am not going to ask colleagues to engage in debate about climate change, but as far as this Committee room is concerned, certainly that ought to be noted.

The Oregon Wildlands Act is a piece of legislation that I care particularly about because it takes several wilderness and wild and scenic provisions from a separate bill that I have authored, and we have appreciated the Forest Service's interest in this.

The Committee passed the lands designation out of Committee as part of my Oregon-California bill in 2014. They did not become law. My view is, it is far past time to actually turn them into law and I am going to pull out all the stops until these fragile landscapes get the protection that they deserve. And it is an especially important time to move ahead with these types of protections. The present Interior Department is reviewing public lands designations in my state now, and Oregonians want to make sure that there is a bright future for their treasured public lands.

Maintaining and improving access to public lands is not just for this generation, but for the generations to come. And this legislation builds on the success that we have seen in protecting public lands. It is going to protect the Devil's Staircase on the Oregon Coast. This is home to one of the last old growth forests on the Oregon Coast mountain range. It protects more than 100,000 acres as national recreation areas. It designates hundreds of miles of best-known fishing streams as wild and scenic.

We have a remarkable range of landscapes and the reality is that recreation is an engine, an economic engine now, for our country, for hikers, climbers, hunters, anglers, and everyone in between. And I think my colleague from Utah knows this just like we know it in Oregon.

We have been working on an important piece of legislation. We will have some more to say about it here fairly shortly, called the RNR bill, the Recreation Not Red-Tape Act, and this Oregon Wildlands package is going to help advance this objective.

Last Congress, the Committee received more than 20 letters supporting the bill from every corner of Oregon, and we have built the coalition involving conservation, fish and wildlife experts, and constituents who particularly want to be outdoors. They are the men and women who care about outdoor sports. This legislation responds to them.

One last point, Mr. Chairman, if I might.

There is another bill on the agenda, S. 468, which establishes a new process for creating rights-of-way across federal lands. This bill has enormous implications throughout the West and, I think it would be fair to say, is a change in decades of legal precedent.

I have heard from folks at home who are concerned about the effect this would have on bedrock land protections and that it could also, depending on how it's interpreted and the exact words, threaten the protection of national monuments, National Forest lands and much of the National Park System and public lands run by the Bureau of Land Management.

I want to be clear to my colleagues that I am interested in working on all legitimate issues relating to rights-of-way claims across federal lands. We ought to identify them. We ought to resolve them, but I continue to be concerned about establishing a sweeping new policy that could raise serious questions about the protection for special places.

Mr. Chairman, again, my thanks for your help on including the Oregon Wildlands Act on the hearing agenda. I look forward to working with you, Mr. Chairman, on the whole package of bills. And it will be interesting to see whether the temperature in this room reverts to this big historic tradition of being just about colder than most days in Lisa Murkowski's home state.

So I thank you and look forward to working with you.

Senator LEE. We will try to bring a little bit more of Alaska into this room to make sure that it is a little bit less tropical.

Thank you, Senator Wyden, for your comments on that.

I do want to point out, with respect to R.S. 2477 roads, the question here is about ownership. This is not a proposal. The legislation that you referenced is not something that would change federal policy in the sense that the federal policy at issue was adopted in a statute, Revised Statute 2477, or R.S. 2477, back in 1866. It created ownership rights. This legislation to which you are referring is one that would create a process whereby ownership claims could be facilitated because they have been dragged forward and almost by inaction by the Federal Government.

Often valid ownership claims have been dismissed or have been neglected resulting in a cloud of title and resulting, in many instances, in access that is needed by the residents of, or visitors to, many states throughout the country, especially in the western United States, in states like the State of Utah where I live.

This is their land. I mean, an R.S. 2477 right-of-way is an ownership interest. It is one that is held by the state. In my state it is jointly held by the state and the county, but to say that you are creating a sweeping change in federal policy simply by establishing a procedure whereby those claims can be established, facilitated, and discussed with the Federal Government, that is not accurate to describe that as a sweeping change to federal policy. That policy was established in 1866 with the passage of R.S. 2477. Now 110 years later in 1976, with the passage of FLPMA, that policy changed but that policy change was made non-retroactively such that legitimate land claims established pursuant to R.S. 2477 between 1866 and 1976 are, in fact, valid claims. So I just wanted to set the record clear on that.

These are, moreover, not merely hypothetical interests that are at stake. For many residents of the State of Utah, their ability to recreate, their ability to access their own land, their ability to get from one part of the state to another part of the state, to get to where their cattle graze, to get to where their farms are, where their businesses happen to be located, it may, in many instances, depend on a R.S. 2477 right-of-way. In many instances, a significant part of a county's road system, its transportation network, will be built on R.S. 2477 rights-of-way.

So these are not merely academic issues. These are things that are part of the way of life of people throughout the western United States, especially in my state. The people who depend on these rights-of-way deserve to have their claims heard. And the American people need to have these things decided, especially given a comment someone made earlier in this hearing, given that the longer we go, given the passage of time that has occurred between the enactment of FLPMA and today, the ability to establish or refute the

existence of a R.S. 2477 right-of-way can grow more difficult over time. All the more reason why we ought to establish procedures whereby we can have the government acknowledge valid claims where they exist.

Mr. Ruhs, in your written testimony, you noted that there has been a dramatic reduction in land that is accessible to the OHV community in Washington County, Utah, that is in the southwestern corner of the State of Utah, since 1999. The OHV industry is, of course, a key economic driver for local communities in that part of the state. The Sand Mountain Special Recreation Management Area alone generates $3 million in economic activity every year. Not surprisingly, the County is eager to preserve what is left in their open OHV areas which is why the county commission recently passed a resolution supporting S. 837.

So can you tell me, sir, what is the BLM doing to preserve OHV and other recreational access areas on public lands in Washington County?

Mr. RUHS. Senator, I do not have the specifics on what BLM is doing in Washington County, but I can tell you on a whole, we are trying to work together with the communities to ensure that we provide recreation access and that we ensure the ability of the OHV community and others to be able to access the public lands and to utilize those resources that are available. I think that is one of the most important things to this department as well as to the BLM is ensuring public access and those recreation opportunities.

Senator LEE. So can I get a commitment from you that you will work with local officials to increase access to recreational opportunities in the county?

Mr. RUHS. Certainly, Senator, you have my personal commitment.

Senator LEE. Thank you, sir.

Okay, I have no additional questions. And in light of that, I want to encourage any members to submit follow-up, written questions for the record. The record for this hearing will remain open for two weeks.

I want to thank both of you and the other witnesses who have come today and provided testimony.

This hearing is adjourned.

[Whereupon, at 10:57 a.m. the hearing was adjourned.]

APPENDIX MATERIAL SUBMITTED

U.S. Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests and Mining
July 26, 2017 Hearing: ***Pending Legislation***
Question for the Record Submitted to Mr. Glenn Casamassa

Question from Senator Ron Wyden

Question: Mr. Casamassa, as you know, Devil's Staircase is located in one of the most isolated regions of Oregon on the Costal Range and provides a unique recreational experience.

The lands the Oregon Wildlands Act would protect as the Devils Staircase Wilderness Area include the last remaining old-growth forests in the Costal Range, which provide critical habitat for the spotted owl and the marbled murrelet, both of which are threatened under the Endangered Species act.

Under the Northwest Forest Plan, logging and the construction of roads are already banned within in Devils Staircase.

I would like to thank the forest service for its support of the Devils Staircase Wilderness proposal, and I want to confirm from you that there aren't any management conflicts for the area.

Response:
The Forest Service supports the proposed Devil's Staircase Wilderness which is an outstanding representation of the Oregon Coast Range and would enhance the National Wilderness Preservation System. We do not expect any management conflicts with this area.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

OCT 17 2017

The Honorable Mike Lee
Chairman
Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
United States House Senate
Washington, D.C. 20510

Dear Chairman Lee:

Enclosed are responses prepared by the Bureau of Land Management to the questions for the record submitted following Subcommittee's July 26, 2017, legislative hearing.

Thank you for the opportunity to provide this material to the Committee.

Sincerely,

Christopher P. Salotti
Legislative Counsel
Office of Congressional and
Legislative Affairs

Enclosure

cc: The Honorable Ron Wyden, Ranking Member
Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining

U.S. Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests and Mining
July 26, 2017 Hearing: *Pending Legislation*
Questions for the Record Submitted to Mr. John Ruhs

Questions from Senator Ron Wyden

Question 1: Mr. Ruhs, S. 468, the Historic Routes Preservation Act, appears to be a public lands giveaway.

This legislation would put in place new policies that would make it easier for states and individuals to build roads across millions of acres of federal land, including through Congressionally protected areas managed by the National Park Service, Fish and Wildlife Service, BLM and Forest Service.

Does the Department of the Interior believe the process should be broadened to make it easier for states and private citizens to build roads across National Parks, National Monuments, National Conservation Areas, Wild and Scenic Rivers, and other federal conservation areas?

S. 468 deals with rights-of-way (ROW) that have potentially been in existence since before 1976, when the Federal Land Policy and Management Act of 1976 (FLPMA) was enacted and R.S. 2477 was repealed. If a route exists in a protected area, the Department of the Interior hopes that a revised version of the legislation will help to address the use and disposition of these routes. As noted in our testimony, we would like to work with the sponsor and Subcommittee on language ensuring consistency, to the extent possible, with protected conservation designations.

Question 2: Your testimony notes that S. 468 could increase, rather than decrease agency workloads, and the Forest Service testimony makes the same observation.

Why then, do you describe a bill that could undermine federal management of federal lands and one that could increase agency workloads as a good starting point for addressing this issue?

There is considerable uncertainty about the existence of R.S. 2477 ROWs that may have been established on public lands prior to enactment of FLPMA. Adjudication of these ROW claims has resulted in substantial litigation over many years between State and local governments, which generally claim title to R.S. 2477 ROWs, and the Federal land management agencies, particularly the BLM, the National Park Service, and the Forest Service.

We believe that a legislative solution would be helpful and provide the best opportunity to resolve longstanding R.S. 2477 issues to benefit the American public.

The Department recognizes the significant work of the sponsors and the Subcommittee to attempt to reach consensus on R.S. 2477. Our State and local partners are looking for clarity and certainty. As noted in our testimony, we would welcome the opportunity to work with the sponsors on several modifications to the bill that we believe would streamline R.S. 2477 claim resolution and make implementation more effective. These modifications include language that:

- Ensures consistency, to the extent possible, with existing protected conservation designations;
- Clarifies the terminology and definitions;

- Ensures that the BLM can continue to meet its other responsibilities under FLPMA and other laws; and
- Provides the BLM and other Department bureaus with sufficient time to carry out the bill's provisions.

Question 3: Mr. Ruhs, according to your testimony, you believe the management language for the proposed national recreation areas in the Oregon Wildlands Act is unclear. The management language prohibits permanent roads within the recreation area as well as commercial enterprises.

It also prohibits the use of motor vehicles or temporary roads within the recreation area except as necessary for administration or public health or safety. And finally, the bill withdraws the lands from mining or mineral leasing.

What part of those management directives do you believe is unclear?

The Department is committed to increasing public access, expanding outdoor recreational opportunities, and increasing management and harvest of timber and other forest products. We believe that the management language for the proposed recreation areas is unclear as it may impact existing commercial timber production activity that relies on ROWs held by adjacent private forest landowners and existing commercial recreational activity.

For example, it is not clear if the prohibition on permanent roads in the proposed recreation areas applies to building additional permanent roads or using existing permanent roads. As noted in our testimony, we would like to work with the sponsor and Subcommittee to clarify whether the BLM would be able to maintain existing permanent roads under the bill.

Similarly, it is unclear how the commercial enterprises language would affect a significant number of permitted recreational outfitters or adjacent private forest landowners who have permanent ROW agreements for commercial use and timber haul on BLM roads.

As noted in our testimony, we would like to work with the sponsor and Subcommittee to clarify and potentially mitigate the impacts to timber producers and recreational permittees under the bill.

Question 4: Last Congress, the BLM testified in strong support of the Wild and Scenic River designations made by the Oregon Wildlands Act. This year your testimony states that the Department believes that there "may be alternative approaches" for managing these sensitive resources.

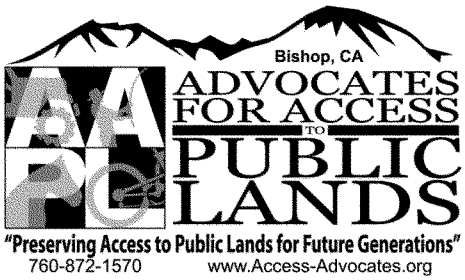
This bill would designate exactly the same river segments as were proposed by last year's bill. Since nothing on the ground is different since last year, is your change in position just a reflection of Secretary Zinke's opposition to any new conservation designations?

Secretary Zinke believes in the responsible stewardship of public lands, which includes conservation designations. The Secretary seeks to restore and enhance trust between the

U.S. Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests and Mining
July 26, 2017 Hearing: *Pending Legislation*
Questions for the Record Submitted to Mr. John Ruhs

American people and the Department of the Interior, which includes careful consideration of all changes to land designations. Secretary Zinke, through Secretarial Order 3347, has pledged to expand access to America's public lands and increase hunting, fishing, and recreational opportunities nationwide. While the Department supports the goals of S. 1548 that align with these important priorities, we are concerned that the bill as currently written could ultimately decrease public access, limit outdoor recreational opportunities, and impede management and harvest of timber and other forest products.

As discussed in our testimony, our recommendation for alternative management approaches could conserve sensitive resources while still accommodating a range of other uses and activities permitted on other BLM-managed lands. In our testimony, we noted that we would like the opportunity to work with the sponsor and the Subcommittee to ensure that a Wild and Scenic River designation is the best mechanism for protecting such resources.



July 25, 2017

The Honorable Lisa Murkowski
Chair
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

Re: S. 32, the California Desert Protection and Recreation Act of 2017

Dear Chairwoman Murkowski and Ranking Member Cantwell,

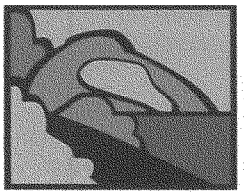
Subject: Alabama Hills National Scenic Area Legislation

Advocates for Access to Public Lands (501-C-4 non profit) is in "support of the recently introduced House and Senate bills (HR 496 and the California Desert Conservation and Recreation Act of 2015 / Title X1X – Alabama Hills National Scenic Area) designating the Alabama Hills a National Scenic Area."

Our organization is pleased with the legislative language that includes access opportunities for the public to enjoy the Alabama Hills for its scenic beauty. We are excited about the upcoming Senate Committee on Energy and Natural Resources hearing regarding Senate bill S. 32: California Desert Protection and Recreation Act (CDPRA) of 2017. We support the conservation of California's unique landscapes, and fully endorse the Title XVII – Alabama Hills National Scenic Area portion of the bill.

Sincerely,

Randy Gillespie, President
Advocates for Access to Public Lands
3063 Mesquite Rd
Bishop, Ca 93514



ALABAMA HILLS
STEWARDSHIP GROUP

July 19, 2017

The Honorable Lisa Murkowski
Chair
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

Re: S. 32, the California Desert Protection and Recreation Act of 2017

Dear Chairwoman Murkowski and Ranking Member Cantwell,

The Alabama Hills Stewardship Group would like to thank you for holding a hearing on Senator Feinstein's bill, S. 32, the California Desert Protection and Recreation Act (CDPRA) of 2017. We support the conservation of California's unique landscapes, and fully endorse the Title XVII – Alabama Hills National Scenic Area portion of the bill.

This designation will guarantee both appropriate conservation measures and continued access to this incredibly scenic landscape. Outdoor recreation is the heart of our local rural economy. This designation will help allow for better-funded maintenance and management of this area, preserving the scenic and historic value important to the future of tourism, in the Owens Valley. We support having local groups and communities passionately giving input on decisions about the stewardship of our public lands.

The Alabama Hills designation story is of a grass roots organic process, to bring a National Scenic Area designation to a jaw-dropping, semi-primitive geological area sandwiched between the eastern crest of the Sierra Nevada Mountains and the small, iconic western town of Lone Pine, CA. Beginning 9 years ago the AHSG gathered input from over thirty (30) stakeholder and forty (40) user groups; then collaborated together

to determine the designation of a National Scenic Area, as best for this historic and visually stunning area.

Hollywood discovered the cinema graphic rich landscape in 1930 and the storyline of the 'Wild West"; and so was born the ***'American Western'*** film genre**.** The Lone Ranger, Hopalong Cassidy, Roy Rogers and John Wayne all filmed here. Over 400 feature length films have been made including the classic, *"How the West Was Won"*. The *'Hills'* scenery has also attracted prominent photographers, such as Ansel Adams.

Over the years support for our bill has both broadened and strengthened, including continuing support from key stakeholders: Inyo County Board of Supervisors; Friends of the Inyo; Lone Pine Paiute Shoshone Tribe; Bishop and Lone Pine Chambers of Commerce; Lone Pine Film History Museum and Advocates for Access to Public Lands.

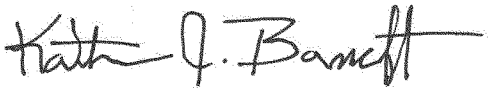
Our legislation has been sponsored by Senator Dianne Feinstein, and has been in the federal legislative process for the last 6 years. The Alabama Hills designation has bi-partisan support as well, being sponsored in the US House of Representatives by Congressman Paul Cook and is contained in his companion bill H.R. 857; also introduced this year. In addition, our legislation has already passed the House, as a stand-alone bill in May of 2016.

Recently, we have raised concerns in our conversations with Senator Feinstein's legislative staff, regarding language in Section 1707 of encroachment on public land. This language was removed from Congressman Cook's bill as of May 2016 following its final mark-up in the House Natural Resources Committee. We encourage dialog between Senator Feinstein's staff and Congressman Cook's office to work out the small changes that will make this bill consistent with stakeholder interest in the Eastern Sierra.

We have worked tirelessly over the years to partner with the Bureau of Land Management to steward this land; and have waited patiently to be represented by our elected officials, to enact this crucial piece of legislation on behalf of their constituents. For these reasons, we urge the committee to advance this important piece of legislation and move S. 32 to markup in a timely manner.

Thank you for your continued work to identify and protect special public lands throughout the California Desert and the Eastern Sierra.

Sincerely,



Kathy Bancroft

President – Alabama Hills Stewardship Group

Cc: Senator Dianne Feinstein
Representative Paul Cook

ALASKA MINERS
ASSOCIATION

121 W. FIREWEED SUITE 120 | ANCHORAGE, ALASKA | 99503 | 907.563.9229 | ALASKAMINERS.ORG

August 8, 2017

Senator Lisa Murkowski
522 Hart Senate Office Building
Washington, DC 20510

Dear Senator Murkowski:

The Alaska Miners Association (AMA) thanks you for the introduction of S. 884, to amend the Omnibus Budget Reconciliation Act of 1993 to require the Bureau of Land Management (BLM) to provide a claimant of a small miner waiver from claim maintenance fees with a period of 60 days after written receipt of 1 or more defects is provided to the claimant by registered mail to cure the 1 or more defects or pay the claim maintenance fee, and for other purposes.

AMA is a professional membership trade organization established in 1939 to represent the mining industry in Alaska. We are composed of more than 1,400 members that come from eight statewide branches: Anchorage, Denali, Fairbanks, Haines, Juneau, Kenai, Ketchikan/Prince of Wales, and Nome. Our members include individual prospectors, geologists, engineers, suction dredge miners, small family mines, junior mining companies, major mining companies, and the contracting sector that supports Alaska's mining industry.

We applaud your efforts to introduce solutions for a long-standing problem for small placer mining operations. The Federal Mining Law of 1872, which governs hardrock mining locations, and various regulatory and statutory requirements require miners to maintain mining claims through an annual maintenance fee and for small miners, a written certification that they hold 10 or fewer claims and therefore qualify for the small miner waiver. This certification must be completed by September 1 annually, and be accompanied by either a maintenance fee or description of assessment work performed. In 1993, Congress amended the 1872 law to provide for defects in the annual requirements to be corrected within 60 days from the date in which BLM notifies the claimants of any defects. However, the Department of the Interior (DOI) has ruled that the law is inconsistent with the Federal Land Policy and Management Act (FLPMA) Section 314 (c) regarding abandonment of claims. Now, there is no administrative remedy for miners to cure simple clerical or delivery issues of otherwise sufficient annual claim recording paperwork

AMA believes it is inappropriate and inequitable for bureaucratic administrative issues to be brought to bear on small family businesses such as placer miners in Alaska who operate responsibly and do virtually no harm to the environment, and seek only to make a living by recovering modest amounts of gold, gold that otherwise goes to no other useful purpose. If it were easy or superabundant, everyone would be a placer miner, but it is not. The lifestyle of placer miners is a part of the American heritage, and should be fostered, not deterred.

We believe S. 884 resolves the concerns of the DOI agencies and allows for a reasonable claim renewal process for small miners. Your efforts to create a more workable process for small miners is greatly appreciated; and please let the record reflect that AMA adamantly supports S. 884.

Sincerely,

Deantha Crockett
Executive Director

Alaska Wilderness League * Audubon Alaska * Center for Biological Diversity
Chichagof Conservation Council * Defenders of Wildlife * Earthjustice
Environmental Protection Information Center * Klamath Forest Alliance * Sierra Club
Sitka Conservation Society * The Wilderness Society

July 25, 2017

Dear Senator:

On behalf of our millions of members and supporters, we are writing to express our concern and opposition to the Alaska Native Veterans Land Allotment Equity Act, S. 785/H.R. 1867. While born out of good intentions, this bill could create thousands of private inholdings across Alaska's public lands, including within national forests, fish and wildlife refuges, and even congressionally designated wilderness areas. It would reopen the Alaska land entitlement process, disrupt precedent under existing law, allow Native Corporations new access to privatizing Alaska's public lands, and undermine the goal of finalizing land entitlements in the state, all while using inequitable means. We urge you to reject this legislation.

In 1971, Congress sunset a land allotment program as a component of the passage of the Alaska Native Claims Settlement Act. At the time, some Alaska Natives were stationed overseas in Vietnam, and they missed their final window to select an allotment. To correct for this, Congress created a new 18-month window in 1998, and amended it in 2000, so that affected Alaska Native Vietnam Veterans could select allotments. 700 applicants applied for 991 parcels of land through the 2000 reopener. Instead of truly resolving this issue for the original discrete class of veterans, however, S.785/H.R. 1867 unnecessarily opens up a completely new land entitlement program and, in doing so, puts thousands of acres of sensitive lands at risk with very little safeguards.

In particular, this new land program differs from past programs in the following ways:

> *1. S. 785/H.R. 1867 removes key restrictions on public lands to be made available for selection, and changes other qualifying criteria.* Unlike the carefully defined restrictions from past programs, this legislation would allow selections from nearly all vacant federal land from anywhere in the state of Alaska. Lands within national wildlife refuges, national forests and Bureau of Land Management lands - including wilderness and inventoried roadless areas - would be available for selection. This unprecedented pool of available lands presents the potential for thousands of private inholdings - each up to 160 acres in size - to be carved out throughout all of Alaska's public lands, limiting access to existing public land users.
>
> *2. It gives Native Corporations access to privatizing key areas of Alaska's public lands.* The bill would allow Native Corporations to offer corporate land to qualified individuals for allotments, and in turn make new selections of equal size from any public lands. Corporations could theoretically "pool" together individual allotments into potentially tens of thousands of acres in selection power. This essentially sets up the opportunity for corporations to cherry-pick the best of the best public lands, including in national forests, and use these new selections for logging or other development.

3. *Eligibility is no longer tied to the Allotment Act sunset in 1971, which defined the 'missed opportunity window'.* Under this proposed legislation, individuals who started their Vietnam military service *after* the Allotment Act was sunset are provided a new chance to select public lands in Alaska. This essentially creates a new land entitlement program for a new subset of individuals. Additionally, heirs of these newly eligible individuals would be allowed to claim an allotment under the legislation.

4. It removes the 'personal use' requirement that used to determine land selections. Historically individuals would have had to show personal use of selected lands; this factor would help determine that the size and location of an allotment was based on an individual's historic use. By removing this requirement, individuals are simply entitled to 160 acres each, drastically increasing the amount of public lands that could be transferred, and dramatically changing the program from its historic roots.

5. It provides for the selection of a second allotment, if an eligible recipient was previously conveyed less than 160 acres. Even if an eligible individual selected and was conveyed an allotment prior to the program sunset, this legislation creates the opportunity for an additional allotment – under the legislation's less rigorous personal use standards – if their prior selection conveyed them less than the full 160 acres – again, increasing the amount of public lands at risk of privatization under these bills.

6. It expedites the conveyance of allotments, setting the stage for incomplete review to protect other private and/or public interests. The legislation requires conveyance of all lands within 5 years of the passage of the act, leaving less than 2 years in some instances for the government to review applications, survey lands, for private parties to raise any objections, and for those objections to be thoughtfully analyzed.

If claims still exist from the original class of veterans, Congress could once again re-open the allotment process for Alaska Native Vietnam Veterans who were serving when the program sunset in 1971, using the model of the 2000 re-opener. This would protect the integrity of public lands across Alaska, while working to ensure that no veteran who served in Vietnam missed an opportunity to make a land claim by the standards of the program at that time.

In summary, this legislation is the wrong approach toward correcting for the missed opportunity that certain Alaska Native Vietnam Veterans faced as a result of their military service. In doing so, it creates an entirely new set of inequities among veterans and Alaska Natives alike, while threatening to hastily carve up intact public lands across the state of Alaska.

Subject: FW: AEMA opposes S. 941
Attachments: image002.jpg; ATT00001.htm; image001.png; ATT00002.htm; Crevice Withdrawal AEMA Comments July 2017.pdf; ATT00003.htm

---

From: Laura Skaer [mailto:lskaer@miningamerica.org]
Sent: Tuesday, July 25, 2017 2:26 PM
To: Hayes, Colin (Energy); Becker-Dippmann, Angela (Energy)
Cc: Dickson, Lane (Energy); Hansen, Heidi (Energy); Hoefler, Annie (Energy); Gray, Spencer (Energy); Matt Ellsworth; Laura Skaer
Subject: AEMA opposes S. 941

Chairman Murkowski and Ranking Member Cantwell:

The American Exploration & Mining Association strongly opposes S. 941, The Yellowstone Gateway Protection Act. Withdrawing an area from mineral entry is an extreme measure that should be considered only when there are no other tools in the tool box. In this case, the Emigrant and Jardine Mining Districts are highly mineralized areas that have been explored since 1863. Congress recognized this when the area was removed from the Absaroka Wilderness bill. Economically viable mineral deposits are rare and hard to find. According to the National Research Council of the National Academy of Sciences in a 1999 report entitled "*Hardrock Mining on Federal Lands*," less than 0.0001 of the earth's continental crust contain economically viable mineral deposits. At a time when the United States dependency on foreign sources of strategic and critical minerals is at an all-time high, we should not be withdrawing highly mineralized areas from mineral entry. As previous U.S. Bureau of Mines studies have indicated, the area has high potential for undiscovered resources. As stated in our attached comments filed with the U.S. Forest Service opposing the withdrawal, the NEPA evaluation/permitting process and USFS surface management regulations provide all the tools necessary to ensure that any mining project is protective of the environment. Withdrawing the area from mineral entry is unwarranted and unnecessary.

Please place this email and the attached comments in the hearing record on S. 941. Thank you.

Respectfully submitted,

American Exploration &
Mining Association

10 N Post St. Ste. 305 | Spokane WA 99201-0705
P. 509.624.1158 | F. 509.623.1241
info@miningamerica.org | www.miningamerica.org

July 17, 2017

Supervisor's Office, Custer-Gallatin National Forest
U.S. Department of the Interior
10 East Babcock Ave. (P.O. Box 130)
Bozeman, MT 59771

SUBMITTED VIA EMAIL: www.fs.usda.gov

RE: Emigrant Crevice Locatable Mineral Withdrawal

Please accept our unique comments on the Emigrant Crevice Locatable Mineral Withdrawal in the Custer Gallatin National Forest. This action adversely affects mineral stakeholders and future mineral exploration in Montana.

The Emigrant mining district was one of the first discovered in Montana, and has been the site of mineral exploration and production since 1863. The reason for this activity is the extensive copper, molybdenum, gold and silver mineralization. This mineralization has been the focus of studies by the Bureau of Mines (see MLA 19-93 Mineral Resource Appraisal of the Gallatin National Forest) and the USGS (North Absoroka Study Area, Montana, USGS Bulletin 1505) which clearly define the production history and the "high potential" for undiscovered resources. For this reason the area was excluded from previous wilderness designation and retained for multiple use management and this fact remains.

Significant advancements in mineral exploration and underground mining technology have once again made the area the subject of exploration interest and proposed work. It is noteworthy that previous gold/tungsten mining was completed in the area with no adverse impact on Yellowstone Park or local community. The idea that exploration and mining at Emigrant and Jardine is a threat to Yellowstone Park is not supported by the historical record or science, since both districts are downstream from the Park.

A full mineral withdrawal is an unnecessary and unwarranted action. USFS under the current laws and regulations have the tools adequate to address any potential adverse consequences of public land uses, including mining. By allowing the USFS to utilize the NEPA process already in place each proposed activity will undergo through vetting by the agencies and the public. This allows the same level of protection for the environment and surrounding communities while allowing for responsible economic activity. We encourage the Federal agencies reject the proposed mineral withdrawal.

American Exploration & Mining Association is a 122-year old, 1,900 member national association representing the minerals industry with members residing in 42 U.S. states (including Montana, six Canadian provinces or territories, and 10 other countries.

Respectfully submitted,

Matthew Ellsworth
Government Affairs

affta

AMERICAN FLY FISHING TRADE ASSOCIATION

19 July 2018

Senate Energy and Natural Resources Subcommittee
304 Dirksen Senate Building
Washington, DC 20510

To Whom It May Concern,

The American Fly Fishing Trade Association, headquartered in Bozeman, Montana, is the representative trade organization for the fly-fishing industry. As such, we are always looking out for the needs and best interests of member outfitters, guides, retailers, manufacturers and conservation partners.

We support S.941, the Yellowstone Gateway Protection Act, and are glad the bill has the opportunity to receive a hearing from the Senate Energy and Natural Resources Committee to address any concerns. We look forward to markup.

The bill is straightforward and clean; it protects the people and the healthy economy of Yellowstone's Gateway.

AFFTA is proud to be a member of the Yellowstone Gateway Business Coalition which now represents more than 350 businesses in Yellowstone's Gateway who have asked for permanent protection from industrial mining.

Here's to a bright future for the Greater Yellowstone area.

Best regards,

Ben Bulis, AFFTA President

July 25, 2017

Senator Lisa Murkowski, Chairman
Senate Energy & Natural Resources Committee
304 Dirksen Senate Office Building
Washington, DC 20510

Senator Maria Cantwell, Ranking Member
Senate Energy & Natural Resources Committee
304 Dirksen Senate Office Building
Washington, DC 20510

Senator Mike Lee, Chairman
Senate Energy & Natural Resources Subcommittee on Public Lands, Forests, and Mining
304 Dirksen Senate Office Building
Washington, DC 20510

Senator Ron Wyden, Ranking Member
Senate Energy & Natural Resources Subcommittee on Public Lands, Forests, and Mining
304 Dirksen Senate Office Building
Washington, DC 20510

Chairman Murkowski and Lee and Ranking Member Cantwell and Wyden:

On behalf of the American Forest Resource Council (AFRC) and its members, thank you for the opportunity to comment on S. 1548, the Oregon Wildlands Act. During the 114th Congress, AFRC sent a similar letter to the Committee regarding S. 1699, a previous version of the Oregon Wildlands Act. Since then, two major decisions by the previous Administration have further restricted public access and science-based management of Federal lands in Western Oregon.

In August 2016, the Obama Administration finalized the Resource Management Plans (RMPs) for the statutorily unique O&C Lands, which are required by law to be managed for "permanent forest production." Despite the clear timber harvest mandate of the O&C Act of 1937, the RMPs only allow sustainable forest management on *20 percent* of over 2 million acres of some of the most productive forestland in the world. Meaning, since the Oregon Wildlands Act was introduced last Congress, more than 1,800,000 acres of O&C Lands and other BLM lands in western Oregon have been administratively designated for conservation purposes.[1]

In January 2017, days before leaving office, President Obama used the Antiquities Act to nearly double the size of the Cascade-Siskiyou National Monument (CSNM) in Southern Oregon. The expansion further eroded the O&C land base by thousands of acres, will reduce the availability of timber harvests to the local manufacturing base by as much as 6 million board feet per year (the equivalent of 72 direct jobs per year in the hardest hit rural communities), and will create

[1] Page 82, Final Environmental Impact Statement, Resource Management Plans for Western Oregon

5100 S.W. Macadam Avenue, Suite 350
Portland, Oregon 97239
Tel. (503) 222-9505 • Fax (503) 222-3255

user conflicts and access issues for private landowners within the highly fragmented, "checkerboard" landscape. It is within this context, we offer our updated comments.

AFRC and its members care deeply about the health and sustainability of public forestlands. In fact, the business model and future success of AFRC members is *dependent* upon the responsible management, ecological health, and long-term sustainability of our national forests and BLM lands.

AFRC and its members also care deeply about the vitality of rural communities in which they work, live, and recreate. Our members employ thousands of rural Oregonians and generate tens of millions of dollars in economic benefits to communities and the state – to say nothing of the charitable contributions, volunteer hours, scholarships, sponsorships, and investments our members make in their communities.

But rural Oregonians faces serious challenges, including an economic crisis. Consider, for example, that last year Josephine County's last sawmill, Rough & Ready Lumber, closed its doors, despite having retooled in an effort to run its mill on smaller logs more readily available under current forest management regimes. The closure of the 90-year-old, family-owned business resulted in the loss of employment for 85 Oregonians in Cave Junction, which is equivalent to the loss of thousands of jobs in Portland.

While data is sparse, one of the best ways to track local economic conditions it to examine the number of students eligible for free or reduced lunch. The number of students eligible for free or reduced lunch is a key indicator of poverty levels in a county or school district. In 1999 (the year before the original Cascade-Siskiyou National Monument was created by President Clinton), 37.1 percent of students in Jackson County (home of the monument) were eligible for free or reduced lunch. In 2017, the year the monument was expanded by President Obama, 54.1 percent of students in Jackson County are now eligible for free or reduce lunch.[2] While the CSNM may or may not bring more seasonal visitors to rural Oregon, it does not appear to be improving the overall quality of life of those living next to the monument – including our children.

Additional designations in western Oregon will only exacerbate the dire economic conditions in rural communities that have not seen any relief – much less an economic boom – from recreation and tourism promised from wilderness, Wild and Scenic, and national monument designations and expansions.

Rural Oregonians face a social crisis. Secure Rural Schools payments to rural Oregon that support essential services such as sheriff patrols, jails, road maintenance, mental health, and education have declined significantly and have now expired with dwindling hope that future support payments will be renewed by Congress. Even if payments are renewed in the current Congress, they will only provide a fraction of historic SRS and timber receipt levels. Property tax constraints imposed by the Oregon Constitution and the Federal Government's control over a huge percentage of Oregon's forestland (as high as 70 percent in some counties), severely restricts Oregon counties' ability to meet the most basic government functions. Unless there is a

---

[2] Oregon Department of Education, Free and Reduced Lunch Reports. 1999 and 2017. Found at: http://www.ode.state.or.us/sfda/reports/r0061Select2.asp

change in how revenue is generated in rural Oregon, these responsibilities will eventually be assumed by the State of Oregon and Oregon taxpayers.

Rural Oregonians face an ecological crisis. Unlike a majority of Oregonians who live in or near a metropolitan area, those living in rural, forested communities suffer disproportionately from our national forest health crisis. Overstocked, unnatural, and fire prone public forestlands expose private property, private forestlands, houses and schools, drinking water supplies and watersheds, and wildlife habitat to unacceptable economic and public safety risks.

Oregonians are working in good faith to find balanced, comprehensive solutions to all of these crises. Just over the last five years, representatives from the forest products community, environmental advocates, elected officials and local leaders, and other interested stakeholders have reinvigorated efforts to come to the table in order to craft solutions with the goal of increasing economic, social, and ecological health in rural Oregon. In fact, AFRC members have collectively spent thousands of dollars defending the collaborative process and collaborative groups in Federal court.

Oregonians' willingness to engage in challenging conversations to resolve our state's crises culminated in two legislative efforts. During the 114th Congress, Senator Wyden and Senator Merkley introduced legislation (S.132) intended to double BLM timber harvests in Western Oregon, create jobs, generate receipts to rural counties, and to protect some of Oregon's most iconic places (including some of the places in S. 1548). Three members of Oregon's House Delegation worked during the 113th Congress to pass bipartisan legislation (Title III, H.R. 1526) to achieve similar economic, social, and ecological outcomes for Oregon's BLM O&C Lands. These efforts clearly demonstrate that Oregon's Congressional Delegation understands that in order to find a durable solution, the solution must be balanced and comprehensive.

AFRC has been, and will continue to be, a proactive and constructive partner in helping find a balanced, holistic solutions to rural Oregon's crises, which S. 1548 does not accomplish. It would not sustain or create additional family-wage jobs in rural Oregon (tourism, recreation, and scenic values would continue under the status quo without S. 1548's designations). It would not address the plight of rural communities nor generate substantial county revenues to provide basic services. It would not address the forest health crisis in Western Oregon or reduce the risk of catastrophic wildfires (it would arguably increase the risk of wildfires due to the lack of proactive management).

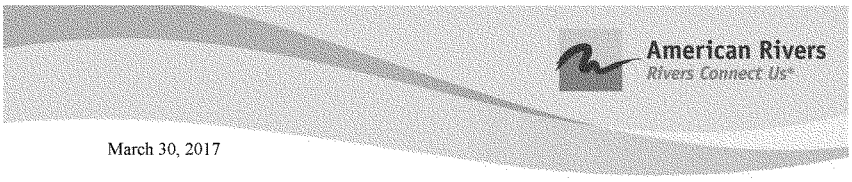
AFRC strongly believes the best way to *undermine* progress on a durable solution to Oregon's rural crises is to pass unbalanced solutions promoted by a handful of interest groups. The controversial Resource Management Plans and Antiquities Act expansion of the Cascade-Siskiyou National Monument over the opposition of local counties, elected officials, and residents has generated significant controversy and fueled multiple lawsuits from all sides. Passage of this bill would further weaken relationships, undercut trust between stakeholders, and tip the scales in favor of a single priority.

Again, AFRC and its members care deeply about our public lands and our rural communities. We believe in compromise and finding realistic and implementable solutions. That is exactly

why AFRC cannot support S. 1548 in its current form and strongly urges the Senate Committee on Energy and Natural Resources to continue directing its attention and focus to comprehensive forestry legislation that will address rural Oregon's economic, social, and ecological crises.

Sincerely,

Travis Joseph, President
American Forest Resource Council



March 30, 2017

The Honorable Mike Lee, Chairman
The Honorable Ron Wyden, Ranking Member
U.S. Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
304 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Lee and Ranking Member Wyden:

On behalf of American Rivers and our 275,000 members, supporters and volunteers we write to express our support for S. 1548, *The Oregon Wildlands Act*. Introduced by Senators Ron Wyden and Jeff Merkley, S. 1548 designates 252 miles of wild and scenic rivers, preserves more than 119,000 acres of the Rogue and Molalla watersheds as National Recreation Areas, and approximately 108,000 acres of wilderness in the Wild Rogue and Devil's Staircase areas of Oregon. The Committee has previously received testimony in support of protecting these special lands and waters within Oregon.

These rivers and lands provide a multitude of economic, cultural, and recreatial benefits for Oregon communities. Many of them are sources of clean drinking water and their wilderness characteristics provide an economic engine for a backcountry outdoor recreation. Protection of the Wild Rogue River in particular is long overdue, and we ask the Committee to move quickly in approving this important legislation.

Federal lands, including many included in this bill, provide over 2 million Oregonians with clean drinking water. The rivers flowing off of these lands also support some of the healthiest stocks of salmon and steelhead remaining in the lower 48 contiguous United States. In turn, communities from the Cascades Mountains to the Oregon Coast rely on the benefits that these public rivers and lands provide in the form of reduced water treatment costs, a robust sustainable recreation economy, and commercial and sportfishing revenues. According to the Northwest Sportfishing Industry Association, the annual economic contribution of sportfishing from public lands in Oregon is $444 million.

Visitors from around the globe come to explore and enjoy the area's outstanding fishing and paddling opportunities. Outdoor recreation is extremely important to Oregon's local economies, supporting more than 140,000 jobs and generating some $12.8 billion in consumer spending. Protecting the Rogue and Molalla Rivers as National Recreation Areas will greatly enhance outdoor recreational opportunities and in the region.

Support for protecting these areas is broad and long-standing. Local businesses, sportsmen, veterans, and conservation organizations are strongly behind S. 1548's goal of guarding these special wild and rugged landscapes and their rivers and streams. We

appreciate Ranking Member Wyden and Senator Merkley's commitment to conserving these valuable lands and waters following years of vetting with Oregon communities.

We also appreciate the opportunity to submit these views for the Subcommittee's consideration. For additional information, please contact David Moryc, Senior Director of River Protection at dmoryc@amrivers.org or (503) 827-648.

Sincerely,

David Moryc,
Senior Director of River Protection

Ripchensky, Darla (Energy)

Subject: FW: Senate bill 785

From: DAVID AMIK [mailto:davamik@gmail.com]
Sent: Friday, August 04, 2017 4:32 PM
To: Kleeschulte, Chuck (Energy)
Subject: Senate bill 785

RE: consideration of bill before Congress? 785 Native veterans" eligibility to apply for Allotment. Please extent my support for this important legislation regarding mine and other native (Yupik in this case) to be given a chance to obtain a portion of their heritage in the form of land allotted to us that were left out of this important government provision.

If you are not representative or liaison for Lisa Murkowski please forward this communication to her attention.

David Amik

davamik@gmail.com

David J. Finnerty
President

August 8, 2017

The Honorable Lisa A. Murkowski
Chairman
Committee on Energy and Natural Resources
U.S. Senate
304 Dirksen Senate Building
Washington, DC 20510

The Honorable Maria E. Cantwell
Ranking Member
Committee on Energy and Natural Resources
U.S. Senate
304 Dirksen Senate Building
Washington, DC 20510

Re: S. 436, San Juan County Settlement Act, Support Letter

Dear Chairman Murkowski and Ranking Member Cantwell,

Ark Land is grateful for the opportunity to express our support for S. 436, the San Juan County Settlement Act. This important legislation will resolve a number of issues that have been pending for decades, including a resolution of the last remaining coal Preference Right Lease Applications (PRLAs) in the Bureau of Land Management's (BLMs) portfolio -- mineral rights that Ark Land has sought to exercise for decades, overlapping land rights the Navajo Nation holds as a result of a 1974 Congressionally authorized resolution of reservation, and protection of culturally, environmentally and historically sensitive lands in northwestern New Mexico.

Of most interest to Ark Land, the legislation authorizes an earlier-reached settlement to a decades long dispute between the BLM and Ark Land over Ark Land's rights to develop the last remaining coal PRLAs in the BLM's portfolio. Ark Land filed PRLAs on 11 parcels in northwestern New Mexico in the late 1960s and early 1970s, and has repeatedly moved to develop the coal on these parcels. However, the parcels overlap or directly adjoin a wilderness study area, the federally protected Fossil Forest, and straddle the historic access road to the Chaco Culture National Historical Park. The BLM has held the position for a number of years that these parcels should be protected from development because of their environmental, cultural and historical significance. Ark Land sought to advance its lease rights, and in 2012 Ark Land and the BLM reached a settlement agreement that provides for the exchange of rights

Ark Land LLC
A subsidiary of Arch Coal, Inc
One CityPlace Dr., Suite 300
St. Louis, MO 63141

office: 314.994.2700

archcoal.com

to develop these PRLAs in return for bidding credits that can be used for coal leases in Wyoming, stipulates the amount of "commercially available coal," and defines a process for reaching an agreement on valuation. Unfortunately, since that settlement agreement was reached, Interior's Solicitor concluded that the Secretary needed statutory authorization to implement the settlement, giving rise to the introduction of the legislation under consideration.

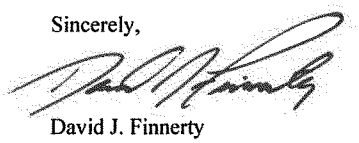
It is important to note, that absent an authorized settlement, Ark Land would move forward with the leases, and to the extent leasing is blocked, litigate its rights through a takings claim that will assuredly be resolved for a significantly higher amount than the cost parameters defined in the settlement. Accordingly, this legislation will save taxpayers from a far more costly litigated solution. Also of note is that this legislation updates and improves legislation introduced by Senators Heinrich and Udall in the last Congress. Most prominent is a provision that stipulates that when using these bidding credits towards leases, Ark Land must pay 50% of the value in cash to cover the state share. This provision both ensures Wyoming gets its fair share of royalties and avoids a possible scoring issue.

Another provision in the legislation resolves a related land rights issue between the BLM and the Navajo Nation that dates back to the early 1980s when the Navajo Nation selected land parcels in this area as part of the 1974 Navajo-Hopi Land Settlement Act. A number of the selected parcels overlap with the parcels on which Ark Land holds PRLAs, and on parcels that were subsequently designated for a variety of protections. The legislation facilitates an exchange of these parcels for alternative parcels the Navajo can select, within defined areas.

Finally, the legislation provides enhanced protections for these lands after the claims from both the Navajo and Ark Land are resolved. All development rights for these lands have been resolved, except for these remaining coal lease rights that will be resolved through this legislation. The proposed enhanced protections have the support of the Navajo Nation as well as the few ranchers with grazing allotments.

In summary, this legislation keeps the statutory promises made to Ark Land and the Navajo Nation, and does so at minimal cost to the federal government when compared to costly takings claims and litigation. Ark Land strongly supports the legislation, and urges the Committee to mark up the legislation and advance it at the earliest possible time.

Sincerely,



David J. Finnerty

BACKCOUNTRY HUNTERS & ANGLERS

July 21, 2017

Senate Committee on Energy & Natural Resources Subcommittee on Public Lands, Forests, and Mining

Re: 7-26-17 *Public Lands, Forests and Mining Subcommittee legislative hearing to receive testimony on various bills.*

Dear Committee Members,

Backcountry Hunters & Anglers provides the following comments for the record to the Senate Committee on Energy & Natural Resources Subcommittee on Public Lands, Forests, and Mining and the July 26, 2017 hearing, *Public Lands, Forests and Mining Subcommittee legislative hearing to receive testimony on various bills.*

BHA is the sportsmen's voice for our wild public lands, waters and wildlife. We seek to ensure North America's outdoor heritage of hunting and fishing in a natural setting through education and work on behalf of fish, wildlife and wild places. With more than 250,000 members and supporters and chapters in 35 states, Washington, D.C. and 2 Canadian provinces, BHA is attracting support from sportsmen and women across the continent.

North America's public lands and waters are the lifeblood of America's hunters and anglers. These are the cherished wild places that restore our spirits and provide the solace of solitude. They're where we go to challenge ourselves in pursuit of adventure and wild fish and game. They are strongholds of important wildlife habitat and fisheries and the Greater Yellowstone Ecosystem is shining example of how these places are woven into the fabric of our family traditions. We write today to ask for your support of Senate Bill 941 and encourage you to sustain our public lands legacy for future generations of hunters, anglers, and outdoor enthusiasts.

The Yellowstone Gateway Protection Act would permanently withdrawal federal mineral rights on 30,000 acres in the Custer Gallatin National Forest adjacent to Yellowstone National Park. Two industrial-scale gold mines have been proposed on these public lands. This bill would safeguard important wildlife habitat, protect the world class fisheries of the Yellowstone River, and uphold traditional recreational use in the region.

BHA values the wild lands, wildlife and fish that make Montana a special place to live and worthy of the nickname "Last Best Place." We are committed to ensuring the conservation of

BACKCOUNTRY HUNTERS & ANGLERS

public lands and waters that provide Montana's world-class hunting and angling opportunities. We thank Sen. Tester for recognizing the importance of these resources by introducing S. 941.

This bill conserves public lands habitat for prized big game species such as elk, deer and moose. It also protects the famed Yellowstone River, which boasts unique angling opportunities and habitat for a range of aquatic species. Impacts from mining, including increased road development and traffic, blasting and leaching, combined with the constant threat of catastrophic toxic contamination, would have lasting ecological implications and permanently endanger this valuable landscape.

S. 941 would ensure that industrial-scale gold mining would never threaten the sensitive habitat, pristine waters and abundant wildlife in and around America's first national park. BHA and more than 350 local businesses agree that the gateway to Yellowstone is no place for industrial mining.

We urge all committee members to put Montana's lands, waters, and wildlife first by supporting *The Yellowstone Gateway Protection Act*. This bill is our best chance to preserve Montana's sporting heritage in the Greater Yellowstone Ecosystem and permanently protect the state's wild lands and local communities. Together we can create jobs, build more robust economies and address important management needs in thoughtful ways that also increase investments in habitat while providing adequate funding to federal management agencies to enhance our proud public lands legacy.

Sincerely,

John W. Gale, Conservation Director
Backcountry Hunters & Anglers
725 W Alder, Suite 11
Missoula, MT 59802
gale@backcountryhunters.org

July 24, 2017

RE: Support for S. 941, The Yellowstone Gateway Protection Act

Dear Members of the Senate Energy and Natural Resources Committee:

On behalf of the 145 businesses and over 3600 jobs represented by Business for Montana's Outdoors, I write today to urge you to support S. 941, The Yellowstone Gateway Protection Act.

This bill is a Made-in-Montana proposal supported by hundreds of local businesses. It take a very straightforward cut and dry approach and is consistent with legislative precedent. In Montana, we oppose overly complicated top-down approached to land management and urge members of your committee to consider the local support for this legislation.

Montanans have an inherent understanding of the critical role that our landscapes play in our community economies, and the many ways that our public lands serve as a backdrop for economic opportunity across the state.

Of 200 Montana businesses surveyed, more than 70% cited the outdoors as a major factor in their decision to start or bring a business to Montana. This sentiment is shared beyond the recreation industry, throughout emerging industries including healthcare, technology, manufacturing, marketing, and research.

There are few places where that value is more important than on the doorstep of Yellowstone National Park, where 30,000 acres of public lands near the northern boundary are being threatened by two proposed industrial-scale gold mining exploration operations.

The world-class amenities that fuel business and the economy in Park County, Montana are threatened by such mining operations. The impacts of mining on these public lands would undoubtedly permanently compromise neighboring communities, affecting air and water quality, road use, habitat disturbance, and more.

This legislation would protect our outdoor amenities, and the jobs and livelihoods that depend on the pristine nature of the lands in question. With Yellowstone as a global icon for visitors, and an outdoor recreation economy in Montana that creates 64,000 direct jobs, and $5.8 billion in consumer spending, we cannot take the risk of

threatening this economic engine for all of its contributions to jobs and the economy of our state.

We urge Senator Daines and the members of the Senate Energy and Natural Resources Committee to take careful consideration, and to support S. 941, protecting Yellowstone National Park and Montana's public lands and economy for generations to come.

Most Sincerely,

Marne Hayes
Executive Director
Business for Montana's Outdoors

St.George

THE BRIGHTER SIDE

The Honorable Orrin Hatch
United States Senate
104 Hart Senate Office building
Washington, D.C. 20510

Re: Southern Utah Open OHV Areas Act

Dear Senator Hatch:

On behalf of the City of St. George, I write to express support for the Southern Utah Open OHV Areas Act (S.837). St George is surrounded by 6 major National Parks, 10 State Parks, and a large number of parks and trails systems. Outdoor recreation is vital to our community residents and is a significant part of our economic base. We host and welcome visitors from across our Country and from around the World who travel here to enjoy our parks and especially our open space.

The Southern Utah Open OHV Areas Act would transfer ownership of the only remaining off-highway vehicle (OHV) area in the county to Washington County to ensure that it remains an open ride area. The Sand Mountain site is an incredible asset and is well known for its beauty and its natural areas that can only be accessed by OHV's. Several annual events are held here which contribute several million dollars to our local economy.

In addition, S. 837 identifies utility corridors that will help preserve access to important water resources and facilities. As we continue to grow our economy and community and in order to accommodate the many who want to move to our area, access to water resources remains critical. The Sand Hollow Regional Pipeline corridor is especially important as the pipeline would connect to the City's municipal water system and provide an efficient and reliable water supply.

Thank you for your leadership on this important legislation.

Sincerely,

Jon Pike

Mayor Jon Pike
City of St. George

CITY OF ST. GEORGE

435-627-4000 | 175 E. 200 N. - St. George, UT 84770 | sgcity.org

TO: U.S. Senate Committee on Energy and Natural Resources

FROM: Jenny Harbine

DATE: July 24, 2017

RE: July 26, 2017 Hearing, S.941 Hearing
Private Property Protections in the Yellowstone Gateway Protection Act

---

This memorandum summarizes the private property rights protections in the Yellowstone Gateway Protection Act ("Act"), which provides, in relevant part:

> Subject to valid existing rights in existence on the date of enactment of this Act, the National Forest System land and interests in the National Forest System land, as depicted on the map, is withdrawn from—
> (1) location, entry, and patent under the mining laws; and
> (2) disposition under all laws pertaining to mineral and geothermal leasing.

For the reasons set forth below, no additional language is necessary or advisable to preserve private property rights under the Act.

1) The lands withdrawn under the Act are explicitly limited to public lands in the National Forest. No private lands are included in the withdrawal (nor could they be, since private lands are not subject to federal mining laws).

2) Even on public lands, the withdrawal is subject to "valid existing rights." Thus, owners of claims in the proposed withdrawal area are exempt from the withdrawal if they can demonstrate a "valid existing right" to mine. The test for determining "valid existing rights" has been well-established for a century. "The discovered deposits must be of such a character that 'a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success, in developing a valuable mine." United States v. Coleman, 390 U.S. 599, 602 (1968) (internal quotations omitted); accord, e.g., Best v. Humboldt Placer Min. Co., 371 U.S. 334, 335-36 (1963); Cameron v. United States, 252 U.S. 450, 459 (1920); Davis v. Nelson, 329 F.2d 840, 846 (9th Cir. 1964); Vane Minerals (US), LLC v. U.S., 116 Fed. Cl. 48, 55 (2014); Freeman v. United States Dep't of the Interior, 37 F. Supp. 3d 313, 320 (D.D.C. 2014).

3) Courts have consistently held that if a claims holder does not have a "valid existing right," he does not have a property right against the United States. E.g., Freeman v. United States Dep't of the Interior, 37 F. Supp. 3d 313, 320 (D.D.C. 2014) (holding that "although a claimant may explore for mineral deposits before perfecting a mining claim, without a discovery, the claimant has no right to the property against the United States or an intervenor"); Mineral Policy Ctr. v. Norton, 292 F. Supp. 2d 30, 48 (D.D.C. 2003) ("'A mining claim does not create any rights

NORTHERN ROCKIES OFFICE 313 EAST MAIN STREET BOZEMAN, MT 59715

T: 406.586.9699 F: 406.586.9695 NROFFICE@EARTHJUSTICE.ORG WWW.EARTHJUSTICE.ORG

against the United States and is not valid unless and until all requirements of the mining laws have been satisfied.'" (quoting Skaw v. United States, 13 Cl.Ct. 7, 28 (1987), aff'd, 847 F.2d 842 (Fed. Cir. 1988)); Am. Colloid Co. v. Babbitt, 145 F.3d 1152, 1156 (10th Cir. 1998) ("Before one may obtain any rights in a mining claim, one must 'locate' a valuable deposit of a mineral.").

4) Withdrawals of public land from location, entry, and patent under the mining laws that are made subject to "valid existing rights" do not impede private property rights. For example, legislation creating the Sawtooth National Recreation Area provided that "[s]ubject to valid existing rights, all Federal lands located in the recreation area are hereby withdrawn from all forms of location, entry, and patent under the mining laws of the United States." 16 U.S.C. §§ 460aa-9 (1976). An owner of five unpatented mining claims within the withdrawal area alleged an unconstitutional taking of his private property rights based on his inability under the legislation to patent claims located in the recreation area. The Court of Federal Claims determined that the language of the Sawtooth Act preserved any existing valid property rights. "At best, plaintiff has suffered a denial of the opportunity to obtain greater property than that which he owned upon the effective date of the Sawtooth Act. This cannot fairly be deemed the divestment of a property interest, save by the most overt bootstrapping." Freese v. United States, 639 F.2d 754, 758 (Ct. Cl. 1981).

5) Language in the North Fork Watershed Protection Act of 2014, Pub. L. 113-291, § 3063 (Dec. 19, 2014), recognizing rights in pre-existing oil and gas leases would be improper in the context of a withdrawal from hard rock mining laws. The North Fork Act, sponsored in the U.S. House of Representatives by then-Representative Steve Daines, withdrew lands in the North Fork of the Flathead River valley from mining and mineral leasing, "subject to valid existing rights." The North Fork Act also contained language preserving the ability of the Interior Department to take action necessary to permit oil and gas drilling activity on leases that were issued before the Act. This language in the North Fork Act reflects the unique status of oil and gas leases, which are themselves considered "valid existing rights." See Solicitor's Opinion M-36910 (Supp.), 88 Interior Dec. 909, 912 (Oct. 5, 1981) ("Once the [oil and gas] lease is issued ..., the applicant has valid existing rights in the lease."). By contrast, as discussed above, mining claims are not "valid existing rights" under hard rock mining laws unless claimants can demonstrate that they meet certain, well-established standards. See also id. (recognizing "valid existing rights" in claims under the 1872 Mining Law only for "a claimant who has made a discovery and properly located a claim"). In sum, oil and gas leases create entitlements (i.e. property rights) that hard rock mining claims do not.

6) Not only is additional language in the Yellowstone Gateway Protection Act unnecessary to protect private property rights, any new language that suggests the presence of property rights that go beyond the well-settled definition of "valid existing rights" for hard rock mining claims could expose the federal government to new claims arising from past and future mineral withdrawals around the country.

CC: U.S. Senator Steve Daines
U.S. Senator Jon Tester

Senator Dianne Feinstein
Senate Energy and Natural Resources Hearing
California Desert Protection and Recreation Act of 2017 and Santa Ana River Wash Land Exchange Act
July 26, 2017

Thank you Chair Murkowski and Ranking Member Cantwell for this hearing. I appreciate the opportunity to testify regarding two important bills: 1) The California Desert Protection and Recreation Act of 2017 (S. 32), and 2) the Santa Ana River Wash Land Exchange Act (S. 357).

California Desert Protection and Recreation Act

First, I would like to speak briefly about the California Desert Protection and Recreation Act of 2017, which is truly a bill I am very proud of and is two decades in the making. I'll tell you a little about its history.

When I first came to the Senate, former California Senator Alan Cranston asked me to take on his desert bill, make it my own and get it passed.

And that's what we did. In 1994, the first California Desert Protection Act passed and transformed the desert.

It established the iconic Death Valley and Joshua Tree National Parks and the Mojave National Preserve.

The desert and its surrounding communities, local businesses, and industry flourished. People from around the world come to experience this magnificent and unique California desert landscape.

According to the National Park Service, in 2016, both Death Valley and Joshua Tree National Parks recorded record numbers of visitors – upward of 3.8 million people. Visitor spending exceeded $155 million and supported more than 2,100 local jobs.

This desert is alive with rare plants and animals found nowhere else. The remarkable wildflower blooms, like the one this past spring, was awe-inspiring. The desert tortoise, big horn sheep, and mule deer are incredible animals that have adapted to this habitat.

If I may, I would like to submit photographs taken by my staff and local residents that showcase the rare beauty of the area. They are included in the packet of support materials I would ask to include in the record.

The desert bill you are considering today builds on a two-decade history and completes the vision set in 1994 by a broad range of stakeholders.

Support for California Desert bill of 2017

Support for this bill includes local elected officials, off-road recreation groups, environmental groups, civic groups, local businesses, and tribes.

First introduced in 2009, this bill is the product of more than a decade of a robust collaborative and public process, as well as two Congressional hearings.

The bill strikes a balance between the many competing uses for public lands across the California desert, while protecting it for current and future generations.

This is why it enjoys a broad range of support. Supporters include:

- **More than 10 off-road recreational vehicle organizations**
- **More than 10 national and local environmental groups**
- **Local elected officials including Inyo County Board of Supervisors**
- **Local businesses, Chambers of Commerce, and student and veterans groups**

I would like to submit the list of endorsements and letters of support to this committee, if I may. I think you will find there is very broad support for this bill.

What the Desert bill does

The California desert has something for everyone: hiking and rock collecting, horseback riding, hunting in the remote backcountry, off-road vehicle trails, prehistoric petroglyphs, tribal cultural sites, and old mining camps and historic towns that are remnants of the "old west."

Some highlights of the bill are:

- **Wilderness:** Designates five new Bureau of Land Management (BLM) wilderness areas covering 234,230 acres

- **Permanent OHV areas:** Designates five existing BLM Off-Highway Vehicle areas covering approximately

142,000 acres as permanent Off-Highway Vehicle recreation areas.

- **Scenic areas:** Designates 18,610 acres of BLM land in Inyo County as the Alabama Hills National Scenic Area, preserving it for continued recreational use.

- **Wild and Scenic Rivers:** Designates 77 miles of waterways as Wild and Scenic Rivers.

- **National Park land:** Adds acreage to Death Valley National Park (39,369 acres) and Joshua Tree National Park (4,518 acres).

- **Renewable Energy:** Aligns the conservation, recreation, and renewable energy activities with the Desert Renewable Energy Conservation Plan.

I thank you again for this opportunity to testify in strong support of this bill, and tell you about the California desert – a true national treasure. I look forward to

continuing to work with this committee to advance and pass this bill that remains one of my top legislative priorities.

Santa Ana River Wash Land Exchange Act

I'd also like to briefly speak in support of the Santa Ana River Wash Land Exchange Act that is also before you today.

Although on a smaller scale than the desert bill I just described, this bill represents the type of collaborative efforts between federal and local agencies, nonprofit, and community groups, to develop smart, effective land use planning with multiple benefits.

This bipartisan bill would help implement a locally-developed plan to restore and protect habitat while maintaining the local mining industry in an environmentally sensitive manner along the Santa Ana River below the San Bernardino Mountains in Southern California.

Support for the Santa Ana bill

As I mentioned, this bill is the culmination of years of collaboration between numerous federal and state agencies, private industry and municipalities representing mining, flood control, water supply, and wildlife conservation, among other interests.

Included among the supporters of this land exchange are:

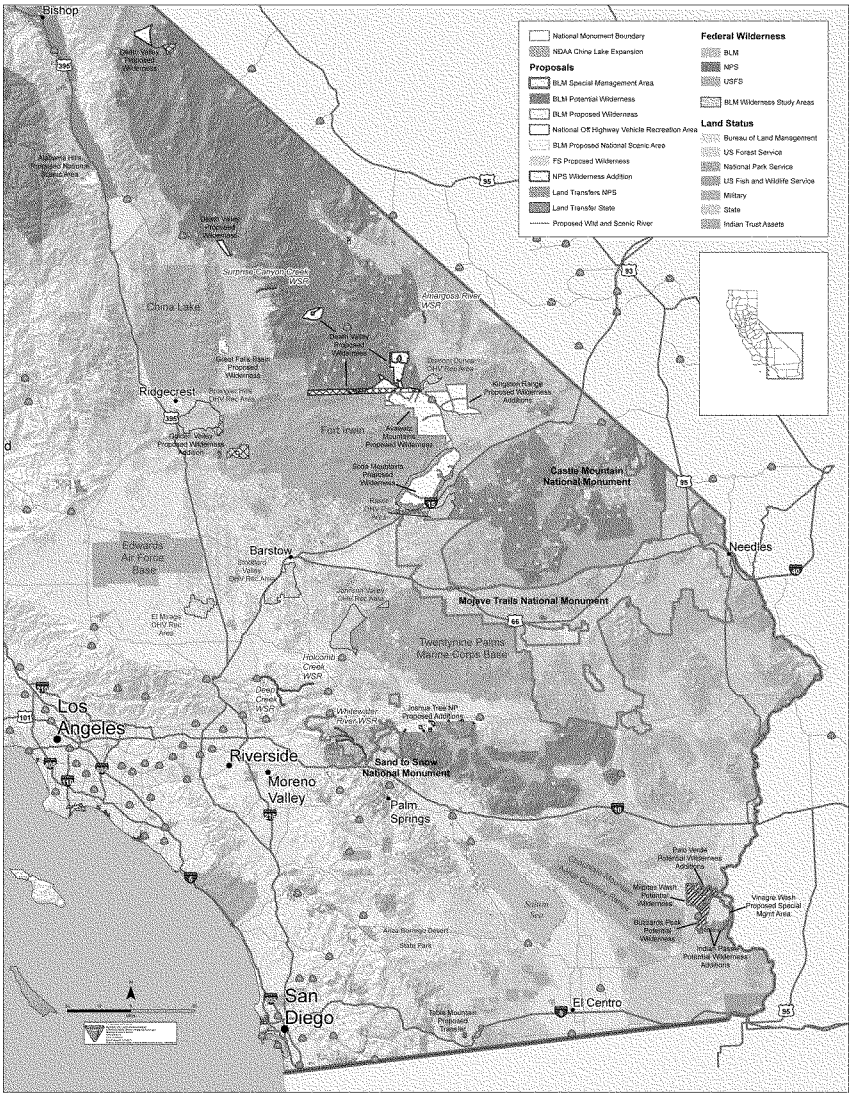
- **County of San Bernardino**
- **City of Redlands**
- **City of Highland**
- **San Bernardino Water Conservation District**
- **San Bernardino Valley Municipal Water District**
- **East Valley Water District**
- **Endangered Habitats League**
- **CEMEX Construction Materials Pacific**
- **Robertson's Ready Mix**
- **Inland Action**

Thank you again to this committee, especially Chair Murkowski and Ranking Member Cantwell, for your leadership and the opportunity to testify about these important bills.

Both of these bills represent many years of collaboration and enjoy a broad range of support. These bills also show how multiple, and at times conflicting, land uses can be harmonized when we all work together to benefit current and future generations of Americans.

California Protection and Recreation Act of 2017

This map prepared at the request of Senator Dianne Feinstein



California Desert Protection & Recreation Act of 2017

Supported by Public Officials, Organizations, and Stakeholder Groups from across California and the Nation.

PUBLIC OFFICIALS & LOCAL GOVERNMENT

- Rep. Paul Cook (R-CA)
- Rep. Pete Aguilar (D-CA)
- Town of Apple Valley

OFF-ROAD RECREATION GROUPS

- Americans for Responsible Recreational Access
- American Sand Association
- BlueRibbon Coalition, Inc.
- Motorcycle Industry Council
- National Off-Highway Vehicle Conservation Council
- Off-Road Business Association
- Recreational Off-Highway Vehicle Association
- Specialty Equipment Market Association
- Specialty Vehicle Institute of America
- United Four Wheel Drive Associations

ENVIRONMENTALISTS

- National Parks Conservation Association
- Conservation Lands Foundation
- Student Conservation Association
- Mojave Desert Land Trust
- Friends of Jawbone
- Friends of El Mirage
- Friends of Big Morongo Canyon Preserve
- Hispanic Access Foundation
- California Wilderness Coalition (CalWild)
- Joshua Tree National Park Association

LOCAL BUSINESSES

- 29 Palms Inn

CIVIC GROUPS

- The Pew Charitable Trusts

ALABAMA HILLS BILL SECTION

- Inyo County Board of Supervisors
- Inyo County Superintendent of Schools
- City of Bishop
- Lone Pine Paiute-Shoshone Reservation
- Lone Pine Chamber of Commerce
- Bishop Area Chamber of Commerce & Visitors Bureau
- Inyo County Film Commission
- Friends of the Inyo
- Alabama Hills Stewardship Group
- Advocates for Access to Public Lands
- Eastern Sierra 4x4 Club

Updated – July 25, 2017

April 21, 2017

The Honorable Dianne Feinstein
Unites States Senate
331 Hart Senate Office Building
Washington, D.C. 20510

Dear Senator Feinstein:

As representatives of national organizations promoting responsible motorized recreation we write in support of, and to thank you for introducing the *California Desert Protection and Recreation Act* (S. 32). This legislation reflects the elements we value in public lands bills – a process that meaningfully engages all relevant local stakeholders and that provides for responsible recreational access where appropriate.

The undersigned organizations have long maintained that support for land use bills must come from the bottom up, as those who live, work and recreate on or near the public lands in question will be the most impacted by the legislation. With regard to off-highway vehicle (OHV) recreation specifically, those who know and ride the trails and areas regularly have the best understanding of which trails and areas are most important and where boundaries must be drawn to protect prime riding locations. That is why we are pleased to note that many local OHV riders, clubs and organizations have supported or will support your bill. Their support makes it possible for us to add our names to the growing list of organizations that endorse S. 32.

With regard to motorized recreation, this bill would designate five existing Off-Highway Vehicle Recreation Areas, including Dumont Dunes, El Mirage, Rasor, Spangler Hills and Stoddard Valley. There are other provisions of the bill which are important to us, but the establishment of the OHV recreation areas would protect responsible OHV recreation in prime areas in perpetuity, much like wilderness designations provide a certain future for areas that will restrict access permanently.

While we support S. 32, representatives from some of the undersigned organizations or other OHV groups may reach out to your staff with additional suggestions or for clarifying language on specific provisions.

Sincerely,

Larry Smith
Executive Director
Americans for Responsible Recreational

Nicole Nicholas Gilles
Executive Director
American Sand Association

• 1152 15th Street NW • Suite 400 • Washington, DC 20005 • PH: (202) 336-5116 •

Sincerely,

Don Amador
Western Representative
BlueRibbon Coalition, Inc.

Duane Taylor
Director, Federal Affairs
Motorcycle Industry Council

Russ Ehnes
Executive Director
National Off-Highway Vehicle Conservation Council

Fred Wiley
Executive Director
Off-Road Business Association

Tom Yager
Vice President
Recreational Off-Highway Vehicle Association

Stuart D. Gosswein
Sr. Director
Federal Government Affairs
Specialty Equipment Market Association

Kathy Van Kleeck
Senior Vice President
Government Relations
Specialty Vehicle Institute of America

Steve Egbert
Vice President
United Four Wheel Drive Associations, Inc.

January 11, 2017

Dear Chairman Murkowski and Ranking Member Cantwell,

Since 1919, the National Parks Conservation Association (NPCA) has been the leading independent voice supporting, promoting, protecting and enhancing America's national parks for present and future generations. On behalf of our more than one million members and supporters across the country, including over 152,000 in California, I write to express our support for Senator Feinstein's recently introduced legislation, S.32, California Desert Protection and Recreation Act. We respectfully request that the legislation be recommended for mark-up.

The California desert is world renowned for its vast and scenic landscapes. It is home to five iconic national park sites (Death Valley National Park, Mojave National Preserve, Joshua Tree National Park, Castle Mountains National Monument, and Manzanar National Historic Site), two National Park Service-managed National Historic Trails (Juan Bautista De Anza and the Old Spanish Trail) and many famous Bureau of Land Management national monuments and wilderness areas. The California desert is home to a spectacular diversity of natural resources and geologic features including sand dunes, natural limestone cave systems, lava flows and lava tubes, rugged desert mountains, forests of Joshua trees and yucca, cactus gardens, multi-colored mountains, wild and scenic rivers, and even stone arches and hoodoos.

This rich landscape has long drawn residents from urban areas to the California desert, and increasingly, visitors from around the world come to enjoy the desert's open spaces, welcoming communities, and spectacular natural resources. A recent Sonoran Institute report estimated that the California desert hosted as many as seven million visits to its public lands in 2015. Joshua Tree National Park alone recorded 2.4 million visitors in 2015, up from 1.6 million in 2014 making these public lands a significant economic engine for desert counties. In fact, Death Valley, Joshua Tree, and Mojave combined to contribute 295 million dollars to California desert economies and communities.

Senator Feinstein proposes a thoughtful balance of responsible land-use management and opportunities for recreation and conservation. This bill, and her efforts, enjoy tremendous grassroots support from local communities of recreationists, businesses and industry, faith-based groups, local tribes, and chambers of commerce. NPCA has worked in partnership with these local communities, elected officials, and stakeholders on California desert legislation since 2009 and will continue to work on protecting, connecting, and enhancing this vital landscape and tourism economy.

We applaud Senator Feinstein for reintroducing S.32 to speak to the components of her legislation which are yet to be accomplished. Considering the profound existing support that these provisions have earned and their longstanding record in the Senate (since 2009), we believe they deserve the opportunity to be marked-up. Thank you for your consideration and we stand ready to answer any questions and provide support, as needed.

Respectfully,

David Lamfrom
Director, California Desert and Wildlife Program

CC: Senator Feinstein
Senator Harris

March 31, 2017

Honorable Senator Dianne Feinstein
United States Senate
Washington, DC 20510

Dear Senator Feinstein,

Conservation Lands Foundation would like to extend our support for the California Desert Protection and Recreation Act (CDPRA) of 2017, and commend you for your steadfast leadership on conservation in the California Desert. This bill fulfills the commitments made to constituents and communities throughout the desert, and secures the vision of well-balanced, landscape-scale conservation consistent with the principles on which the California Desert Conservation Area was created in the Federal Land Policy and Management Act of 1976.

Conservation Lands Foundation appreciates your work to consider the needs of a broad array of stakeholders in the legislation. In addition to designating new wilderness areas and over 70 miles of wild and scenic rivers, the bill will also protect 43,000 thousand acres of land adjacent to Joshua Tree and Death Valley National Parks, ensure that hundreds of cherished off-road routes remain open, and that conservation of the region is compatible with other needs such as the upgrade and maintenance of utility infrastructure.

These provisions and other provisions of the bill will help boost the significant outdoor recreation and tourism economy of the California Desert, and uphold the priorities of the public throughout the desert. These are priorities that you and your office worked with many different communities – as well as lawmakers, on a bipartisan bases – to balance, and to achieve thoughtful consensus. We recognize the hard work that you and all of those desert stakeholders have put into crafting the pieces of this legislation, and we support the broad public input and bipartisan cooperation that went into this bill.

Additionally, by requiring that land use plans and decisions regarding rights-of-way incorporate the impacts of climate change on species migration, soil, air quality, water quality and quantity, this bill ensures the long-term preservation and sustainability of the California Desert, its residents, and its ecosystems, and its scientific, cultural, historic, recreational, and natural values. Protecting these places ensures that future generations can continue to enjoy them.

Finally, we would like to encourage you continue to work with Representative Paul Cook, and other bipartisan colleagues in the House of Representatives and in the Senate to ensure that this bill advances in Congress and is signed into law with all of its current provisions.

Conservation Lands Foundation strongly supports your efforts to protect and enhance the California Desert, and encourages you to employ all means at your disposal to achieve CDCRA's important desert conservation objectives.

835 E 2nd Ave #314 • Durango, CO 81301 • 970.247.0807 • www.ConservationLands.org

Sincerely,

Elyane Stefanick
California Program Director
Conservation Lands Foundation

CC: Honorable Senator Kamala Harris
Honorable Representative Paul Cook
Honorable Representative Raul Ruiz
Honorable Representative Paul Vargas

January 26, 2017

The Honorable Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, DC 20510

Dear Senator Feinstein:

On behalf of the Student Conservation Association and myself personally, I want to thank you for the introduction of S. 32, The California Desert Protection and Recreation Act of 2017. Your long-standing commitment to protecting the California Desert, as well as your determination to secure a balance between protection, renewable energy production, and outdoor recreation is deeply appreciated. It is not an easy task to take such a comprehensive approach to guiding the management of a place like the California Desert, but you have made that goal a hallmark of your efforts in the California Desert – and that will forever be seen as a monumental accomplishment.

While not deeply involved in the legislative process, the Student Conservation Association has committed itself to assisting federal land management agencies in the all-important implementation of you legislation. Our efforts have included OHV route restoration, wilderness inventory, resource monitoring, trail maintenance, and fence building. It has been an honor to work alongside resource professionals from the Bureau of Land Management and National Park Service, as well as with important non-profit organizations such as The Amargosa Conservancy, California Wilderness Coalition, and Friends of Jawbone.

1230 Preservation Park Way ♦ Oakland, CA ♦ 94612 ♦ 510-832-1966
www.thescaa.org

I am also proud to say that several of the Conservation Interns we have placed to do this work now work for the BLM, NPS, as well as in the private sector with Shelton Douthit Consulting.

So again, from the Student Conservation Association, congratulations and thank for all your efforts to secure a bright and shining future for the California Desert.

Sincerely,

Jay Thomas Watson

Jay Thomas Watson
Vice President
Western United States

Mojave Desert Land Trust
Preserving land for ever forever
P.O. Box 1544 • 60124 29 Palms Hwy • Joshua Tree, CA 92252
Ph (760)366-5440 Fax (888) 869-4981 www.mojavedesertlandtrust.org

17 JUN -6 AM 9:38
FEINSTEIN
WASHINGTON, D.C.

May 25, 2017

The Honorable Dianne Feinstein
United States Senate
Washington, DC 20510

Subject: Support for the California Desert Protection and Recreation Act of 2017 (S. 32)

Dear Senator Feinstein:

Mojave Desert Land Trust (MDLT) is pleased to support the California Desert Protection and Recreation Act of 2017 (S. 32).

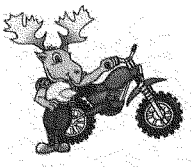
Your efforts on behalf of the California Desert represent a tremendous legacy. From the passage of the California Desert Protection Act of 1994 and support of the Catellus land acquisition to the recent establishment of the Mojave Trails, Sand to Snow and Castle Mountains National Monuments, your leadership has guided the way to protect our precious and fragile desert landscape. The introduction of the California Desert Protection and Recreation Act of 2017 (S. 32) builds on these efforts, and demonstrates a continued commitment to an array of desert stakeholders.

We look forward to working with your staff to continue to support and refine this legislation. The protection it provides for desert landscapes is crucial for its wilderness and groundwater, and will create more commonsense management for our public lands.

Thank you for your continued dedication to this magnificent place.

Respectfully,

Frazier Haney
Conservation Director



Friends of
Jawbone
sustainable trail recreation

Friends of Jawbone
PO Box 1902
Cantil, CA 93519

jawbone@wildblue.net
(760) 373-1146
www.jawbone.org

January 31, 2017

The Honorable Dianne Feinstein
United States Senator
331 Hart Senate Office Building
Washington, DC 20510

Re: S.32 – California Desert Protection and Recreation Act of 2017

Dear Senator Feinstein,

Friends of Jawbone is a long-time partner of the Bureau of Land Management's Ridgecrest Field Office. We've raised millions of dollars in grants and logged thousands of volunteer hours to assist in the BLM's management of OHV recreation in Eastern Kern County.

I am writing today to express our support for S.32, the California Desert Protection and Recreation Act of 2017. Your bill offers some of the strongest protections for OHV recreation to ever be introduced in the United States Congress and we thank you for that.

The BLM managed Spangler Hills OHV Area is the largest OHV area in our region. It has grown in importance due to recent military base expansions that have taken nearly one-third of all OHV recreations area acreage in the California Desert. We now have to look to the Spangler Hills OHV Area to absorb this devastating loss of OHV opportunity.

Now a boom of renewable energy development in Eastern Kern County threatens to encroach on the Spangler Hills OHV Area and we fear even more loss of OHV recreation lands to this new and aggressive competing use.

That is why Friends of Jawbone especially supports the designation and proposed expansion of the Spangler Hills OHV Recreation Area in your California Desert Protection and Recreation Act of 2017. Your proposal to designate an Expansion Study for Spangler will reenable competitive use of the popular "C" routes that are currently outside this OHV recreation area. To us, this signals your understanding of the need to make up for some of OHV's lost acreage and lost opportunities for organized events.

Given its great importance to both our desert communities and our metropolitan residents, it is important that we enact protections for managed and sustainable OHV-based recreation on the public lands in the California Desert. We look forward to continue working with you to do exactly that.

Sincerely,

Ed Waldheim
President

2005 Market Street, Suite 1700 215.575.9050 Phone
Philadelphia, PA 19103-7077 215.575.4939 Fax

901 E Street NW, 10th Floor 202.552.2000 Phone
Washington, DC 20004 202.552.2299 Fax
www.pewtrusts.org

February 2, 2017

The Honorable Dianne Feinstein
U.S. Senate
Washington, DC 20510

Dear Senator Feinstein:

On behalf of The Pew Charitable Trusts, I write to express our strong support for S. 32, the California Desert Protection and Recreation Act of 2017. We applaud you for your continued dedication and leadership on behalf of the California Desert, and we look forward to working with you to see its approval by the 115th Congress.

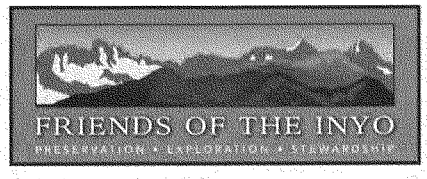
The Pew Charitable Trusts' U.S. Public Lands program works to protect our nation's unique natural heritage—in areas where there is strong local support—through Congressionally designated wilderness, administrative planning in the West, and Presidential proclamation of national monuments. In California, we have worked with state and local conservation groups for more than a decade to secure wilderness, national monument, and administrative protections for your state's desert landscapes. With our partners in the Campaign for the California Desert, we have helped organize local businesses, chambers of commerce, country supervisors, members of city councils, other community leaders, off-road vehicle enthusiasts, faith-based organizations, and veterans to support desert protection. We expect this support for desert protection will only grow with the introduction of the California Desert Protection and Recreation Act.

Your legislation will protect California's desert by designating five new wilderness areas, establishing one new scenic area, and adding 77 miles of waterways to the National Wild and Scenic Rivers system. S. 32 will also facilitate the implementation of the Desert Renewable Energy Conservation Plan by protecting California Desert Conservation Lands from harmful mining activities.

We deeply appreciate and value your leadership on behalf of the California Desert. We look forward to continuing to work with you to ensure these special wild lands and recreation areas are protected for future generations.

Sincerely,

Mike Matz
Director, U.S. Public Lands
The Pew Charitable Trusts



July 19, 2017

The Honorable Lisa Murkowski
Chair
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Senate Energy and Natural Resources Committee
709 Hart Senate Office Building
Washington, DC 20510

Re: S. 32, the California Desert Protection and Recreation Act of 2017

Dear Chairwoman Murkowski and Ranking Member Cantwell,

Friends of the Inyo would like to thank you for holding a hearing on Senator Feinstein's bill, S. 32, the California Desert Protection and Recreation Act (CDPRA) of 2017. We support this bill, as it embodies Senator Feinstein's decades of work to consider the needs of a broad array of stakeholders across the California Desert. This bill fulfills the commitments made to constituents and communities throughout the desert, and secures the vision of well-balanced, landscape-scale conservation consistent with the principles on which the California Desert Conservation Area was created in the Federal Land Policy and Management Act of 1976.

In order to balance the growing pressures and priorities in the California Desert, and ensure public access for the future, in 2010, Senator Feinstein introduced the California Desert Conservation and Recreation Act (CDCRA), which also called for the establishment of national monuments. Preceding and following the establishment of those monuments by executive order in 2016, Senator Feinstein unwaveringly advocated for the legislative process and affirmed her commitment to see all aspects of her legislation fulfilled. Then, in January 2017, the Senator introduced the S. 32, which largely consists of the remaining provisions of the CDCRA. S. 32 represents years of careful work to balance the needs of an array of desert stakeholders, and builds on previous efforts to balance competing land uses.

In particular we support the designation of a National Scenic Area in the Alabama Hills, the protection of additional acreage in Death Valley National Park and the responsible management of recreational off-road routes in the desert. We are also pleased to see provisions requiring that land use plans and decisions regarding rights-of-way incorporate

the impacts of climate change on species migration, soil, air quality, water quality and quantity.

We commend the bi-partisan effort to protect and conserve the incredible natural resources in California and especially the Alabama Hills. However, we raised concerns in our letter to Feinstein dated April 10, 2016 regarding language in Section 1707 of encroachment on public land. This language was removed from Congressman Cook's bill as of May 2016 following its final mark-up in the House Natural Resources Committee. We encourage communication between your staff and Cook's office to remedy discrepancies in the Alabama Hills Scenic Area language.

We support the bill moving forward through Congress with no net loss of its conservation protections and provisions, and necessary corrections to Section 1707. Friends of the Inyo looks forward to seeing the small changes needed to make this bill consistent with stakeholder interest in the Eastern Sierra, particularly the community of Lone Pine. Thank you for your continued work to identify and protect special public lands throughout the California Desert and the Eastern Sierra. We believe our concerns can be addressed through the legislative process and are eager to work with you, Congressman Paul Cook, Senator Feinstein, and the members of the Senate Energy and Natural Resources Committee. For all of these reasons, we urge the committee to continue to advance this important piece of legislation and move S. 32 to markup in a timely manner.

Sincerely,

/s/ Jora Fogg
Preservation Manager

Cc: Senator Dianne Feinstein
Representative Paul Cook

April 10, 2017

The Honorable Diane Feinstein
United States Senate
331 Hart Senate Office Building
Washington, DC 20510

Dear Senator:

Friends of the Inyo wishes to extend our support for the California Desert Protection and Recreation Act (CDPRA) of 2017, and commend you for your steadfast leadership on conservation in the California Desert. In particular we support the designation of a National Scenic Area in the Alabama Hills, the protection of additional acreage in Death Valley National Park and the responsible management of recreational off-road routes in the desert. We are also pleased to see provisions requiring that land use plans and decisions regarding rights-of-way incorporate the impacts of climate change on species migration, soil, air quality, water quality and quantity.

We too share the bill's vision of well-balanced, landscape-scale conservation consistent with the principles in the California Desert Conservation Area. The provisions of the bill will help boost the significant outdoor recreation economy in the California Desert, and uphold the priorities of the public throughout the desert. We recognize the hard work that you and desert stakeholders have put into crafting the pieces of this legislation.

We commend the bi-partisan effort to protect and conserve the incredible natural resources in California and especially the Alabama Hills. However, we would like to bring to your attention the language in Section 1707 regarding encroachment on public land. This language was removed from Congressman Cook's bill as of May 2016 following its final mark-up in the House Natural Resources Committee. We encourage communication between your staff and Cook's office to remedy discrepancies in the Alabama Hills Scenic Area language. We recommend a meeting with the Alabama Hills Stewardship Group in the coming weeks to review current Alabama Hills 'National Scenic Area' bill language in H.R.857 and how to best incorporate the updated language into SB.32.

Friends of the Inyo looks forward to seeing the small changes needed to make this bill consistent with stakeholder interest in the Eastern Sierra, particularly the community of Lone Pine. Thank you for your continued work to identify and protect special public lands throughout the California Desert and the Eastern Sierra.

819 N. Barlow Lane Bishop, CA 93514 760.873.6500 Friendsofthelnyo.org

FRIENDS OF THE INYO
PRESERVATION • EXPLORATION • STEWARDSHIP

Sincerely,

Jora Fogg
Preservation Manager

CC:
Honorable Senator Kamala Harris
Honorable Representative Paul Cook

819 N. Barlow Lane Bishop, CA 93514 760.873.6500 Friendsofthelnyo.org

Friends of El Mirage • 75 Cokisa Rd, El Mirage, CA 92301 • (760) 388-4411
webmaster@elmirage.org www.elmirage.org

January 31, 2017

The Honorable Dianne Feinstein
United States Senator
331 Hart Senate Office Building
Washington, DC 20510

Re: California Desert Protection and Recreation Act of 2017 (S.32)

Dear Senator Feinstein,

Friends of El Mirage is a long standing cooperative partner of the Bureau of Land Management's Barstow Field Office by assisting with the operations of the popular El Mirage OHV Recreation Area. For fifteen years we have brought together user groups to provide volunteers and grant-based funds for visitor services, OHV safety, and environmental stewardship.

We are excited to support your California Desert Protection and Recreation Act of 2017 (S.32) because of the strong protections it proposes for the El Mirage OHV Recreation Area. We are also delighted by the inclusion of the proposed Expansion Study Area that will allow the BLM to better manage the popular 4-wheel drive trails in the OHV areas's northern hills.

The center piece of this OHV recreation area is the El Mirage dry lakebed. At more than five miles long and up to a mile and a half wide, the lakebed sees a most unusual array of activities. Sailers Cove is home to world class wind sailing, and Gyrocopter Cove hosts ultra-light and gyrocopter flying enthusiasts. The Southern California Timing Association has been conducting land speed racing events across the lakebed since 1937 and maintains the official roster of the El Mirage 200 MPH Club. Other recreational pursuits on the lakebed include model rocketry and remote control aircraft flying. The lakebed also enjoys a steady stream of movie, television and music video projects.

But by far, the most popular recreational activity at El Mirage is OHV riding. Located just one hour north of San Bernardino, the El Mirage OHV Recreation Area is the largest and closest OHV area to residents of Southern California, attracting over 100,000 visitors annually. Here families come to ride their OHV's, camp, and enjoy quality time together in the great outdoors.

The Friends of El Mirage believes that this special area should be protected from renewable energy development and other competing uses for current and future OHV users. That is why we strongly support the designation of the El Mirage OHV Recreation Area and Expansion Study Area in your California Desert Protection and Recreation Act of 2017.

We look forward to working with you to protect recreational opportunities in the California Desert.

Sincerely,

Ed Waldheim, President
Friends of El Mirage

FRIENDS OF BIG MORONGO CANYON PRESERVE

7/2017

Friends of
Big Morongo Canyon Preserve
Directors:

Patrick Casey
Meg Foley
Ann Garry
Bill La Haye
David Miller
Tish Miller
Jane Mootz
Jane Olson
Laura Sherrod

Senator Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, D.C. 20510

To the Honorable Dianne Feinstein,

We appreciate your thoughtful balance of responsible land-use management while protecting opportunities for recreation and conservation. This bill, and your on-going efforts, enjoy tremendous grassroots support from local communities of recreationists, businesses and industry, faith-based groups, local tribes, and chambers of commerce. We appreciate your interest in and efforts to:

- Protect 230,000 acres (359 square-miles) of federal land as wilderness in southeastern California, ranging from the Avawatz Mountains near Death Valley to Milpitas Wash in Imperial County;
- Enlarge Death Valley National Park and Joshua Tree National Park by 43,000 acres (67 square-miles);
- Protect important waterways such as the White Water River from future dam construction and development;
- Establish the 75,575-acre (118 square-mile) Vinagre Wash Special Management Area in Imperial County where many ecologically sensitive areas and Native American heritage sites would be protected;
- Designate the Alabama Hills area in Inyo County (the location for dozens of movies and television shows) as a National Scenic Area so that its priceless vistas are protected;
- Permanently prohibit the staking of new mining claims on approximately 10,000 acres of land sacred to the Quechan Tribe in Imperial County;
- Mandate the study and protection of Native American cultural trails along the Colorado River;
- Help make it more difficult for developers to exploit groundwater in or near the Mojave National Preserve; and,
- Require the Department of the Interior to study the future impacts of climate change on the California desert, to mitigate these impacts and to identify and protect important wildlife migration corridors in the region.

We thank you for fulfilling your promise to bring these parts of the legislation forward which were not enacted when the Antiquities Act was utilized to form the new National Monuments.

Friends of Big Morongo Canyon Preserve

BMCP
P.O. Box 780
Morongo Valley, CA 92256

www.bigmorongo.org

Building Bridges, Changing Lives

May 12, 2017

Honorable Senator Dianne Feinstein
United States Senate
Washington, DC 20510
Dear Senator Feinstein,

Hispanic Access Foundation would like to share our support and thanks for the reintroduction of California Desert Protection and Recreation Act (CDPRA) during the 115th Congress in January 2017. Your ongoing support of the California desert and the people who call it home has been incredible and shown through your actions since the original California Desert Protection Act of 1994, last year's CDPRA, and your encouragement of the use of the Antiquities Act to establish the California Desert National Monuments.

We support the CDPRA, which protects desert landscapes while also increasing recreation and tourism values that are important to the region. We agree with the legislations' provisions, including:

- Expansion of Death Valley and Joshua Tree National Parks
- Establishment of wilderness areas, which will create wildlife corridors, and protect climate change mitigation values of the desert
- Designation of Wild and Scenic rivers, promoting adaptability of fragile desert ecosystems
- Protection of off-highway vehicle recreation areas
- Mandate to study Native American cultural trails along the Colorado River

We believe that it is critical that our public lands be reflective of our diverse cultures. We all benefit from cultural traditions, which have protected our natural resources for generations.

We thank you for your long-term vision and steadfast commitment to the California Desert landscape.

Sincerely,

Maite Arce, President and Founder
Hispanic Access Foundation

1030 15th St., NW, Suite B/1 #150 · Washington DC 20005 · t. (202) 640-4342 · f. (202) 640 4343 · http://hispanicaccess.org

April 30, 2017

The Honorable Dianne Feinstein
US Senate
Washington, DC 20510

Subject: Support for S.32, the California Desert Protection and Recreation Act of 2017

Dear Senator Feinstein:

CalWild is pleased to support S.32, the California Desert Protection and Recreation Act of 2017. The Kingston Range, Avawatz Mountains, Soda Mountains, Great Falls Basin, Vinagre Wash and Milpitas Wash regions are national treasures and deserving of immediate protection. We have worked with you to protect these areas since 1994, and we intend to continue to support you in any way possible.

In the months to come we intend to build support for S.32, particularly in San Bernardino County. Please let us know if there anything else we can do to help you advance the measure. Thank you for your continued leadership on desert conservation.

Sincerely,

Ryan Henson
Senior Policy Director
CalWild
3313 Nathan Drive
Anderson, CA 96007
530-365-1455
rhenson@calwild.org

Statement of CalWild before the Subcommittee on Public Lands, Forests, and Mining
Committee on Energy and Natural Resources
Hearing on S. 32
Wednesday, July 26, 2017

Chairwoman Murkowski and members of the committee, thank you for scheduling this hearing on this important bill regarding conservation of the California Desert.

CalWild is a non-profit conservation organization founded in 1976. Our mission is to protect the natural landscapes that make California unique, providing clean air and water, a home to wildlife, and a place for recreation and spiritual renewal. CalWild is the only statewide organization dedicated to protecting California's wild places and native biodiversity.

We would like to start by expressing our deep appreciation to Senator Feinstein, not only for her work with diverse stakeholders in order to craft a balanced bill, but also for her incredible work in championing the preservation of our beautiful California desert.

For the past decade, CalWild, along with local partners, have been working on the ground in San Bernardino, Inyo, Riverside, and Imperial counties to garner support for this desert legislation. We live in or close to these communities and through our advocacy for Senator Feinstein's bill, we have built relationships and trust among stakeholders that frankly did not exist before the work began to put this bill together. Senator Feinstein rightfully challenged us and other conservation groups to help her craft a balanced bill that would have not only our support, but also off-roaders, veterans, local government, utilities, business, tribes, the military and others. S. 32 accomplishes that objective. It is consistent with her pragmatism and decades-long commitment to work "across the aisle" to get things done.

From its iconic Joshua trees to its spectacular wildflower blooms, the California desert is one both of the harshest landscapes in America while at the same time one of the most fragile and beautiful. It is a place of serenity, solitude, wonderment, and adventure. Its biodiversity rivals the redwood forests, and its cultural resources date back 10,000 years ago from Native American rock art and sacred sites to the more recent relics of General Patton's WWII training camps. The California desert is also enjoyed and used by people from all over the world and all walks of life, who experience it in vastly different ways. From nature photographers to astronomers, from hunters to hikers, from off-roaders to researchers, our desert has something for everyone.

This legislation encompasses unique, undeveloped, ecologically and geologically significant, culturally important, and scenic areas of public land in the California desert. Specifically, S. 32 will:

- Protect 278,230 acres as wilderness;
- Designate 81,000 acres in Imperial County as a "special management area" where wilderness-quality lands would be protected and where motorized recreation would be better-managed;
- Increase the size of Death Valley National Park and Joshua Tree National Park by about 44,000 acres;
- Protect 18,610 acres of the Alabama Hills as a Scenic Area;
- Protect 77 miles of stream as wild and scenic rivers;
- Prohibit development, mining, off-highway vehicle (OHV) use (except on designated routes), grazing, military training and other surface disturbing activities on 6.5 million acres of federal lands in the desert;
- Mandate the study and protection of a cultural trail and the features associated with it along the Colorado River that is sacred to several tribes;
- Transfer a 994-acre Bureau of Land Management holding in San Diego County to Anza-Borrego Desert State Park and require the state to manage the land as wilderness;
- Withdraw legislative protection from 126,000 acres of existing wilderness study areas;
- Designate five existing, administratively designated OHV areas covering approximately 142,720 acres as permanent OHV recreation areas;
- Require the Department of Interior to study the impact of climate change on California desert species migration and to incorporate the results of the study into land use plans;
- Protect water in desert aquifers from being unsustainably pumped from the ground and sold to parties elsewhere (which could lead to the loss of natural seeps and springs that are critical to the survival of wildlife);
- Protect 28,000 acres of land in the Juniper Flats area from energy development;
- Allocate 35% of the revenues generated from energy leasing on federal lands within the California Desert Conservation Area (CDCA) to mitigating the damage caused by wind and solar development in the CDCA; and
- Send another 50% of the revenues generated from energy leasing to the State of California and affected counties.

The measure will also provide a further boost to tourism, which is an important component of its local support.

This legislation is similar to bills the Senator has introduced in past Congresses, and that the Subcommittee has heard previously, and we hope the full Committee on Energy and Natural Resources will proceed with expedited consideration and approval of S. 32 and send it onto the Senate floor.

Thank you for considering our testimony.

74485 National Park Drive, Twentynine Palms, CA 92277

www.joshuatree.org • 760-367-5525 • 760-367-5583 fax

Board of Directors

Mark Wheeler, President

Darrell Shade, Vice President

Kevin Powell, Treasurer

Laraine Turk, Secretary

Erin Adams

Paul Smith

Curt Sauer

Karen Tracy

Bill Truesdell

Bob Zimmerman

July 23, 2017

Senator Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, D.C. 20510

To the Honorable Dianne Feinstein,

Thank you very much for your efforts, with California Desert Protection and Recreation Act of 2017, to bring forth the parts of the legislation that were not enacted when Sand to Snow National Monument, Mojave Trails and Castle Mountains National Monuments were formed via the Antiquities Act.

The Joshua Tree National Park Association is especially grateful for your efforts to allow the Park Service to accept land donations and the Joshua Tree Visitor Center via boundary adjustments.

We are very impressed with the extensive outreach you did to local stakeholders and communities. Your thoughtful balance of responsible land-use management and opportunities for recreation and conservation reflects the comments shared in numerous local meetings.

We join the tremendous grassroots support from local communities of recreationists, businesses and industry, faith-based groups, local tribes, and chambers of commerce in offering our full support of the California Desert Protection and Recreation Act of 2017.

Thank you for your continued efforts to protected our local lands while enhancing local economies.

Sincerely,

Meg Foley, Executive Director
Joshua Tree National Park Association

Our mission, as a cooperating association, is to assist with preservation, education, historical and scientific programs for the benefit of Joshua Tree National Park and its visitors.

29 Palms Inn

July 24, 2017

Senator Dianne Feinstein
United States Senate
Washington, D. C.

Re: Endorsement Of Senate Bill 32
California Desert Protection and Recreation Act

Dear Sen. Feinstein:

Our family has owned the historic 29 Palms Inn in the Mojave Desert since 1928. It is a successful tourism destination serving as a gateway to Joshua Tree National Park, The Mojave National Preserve, Death Valley National Park, over 60 federally designated wilderness areas, and the three new desert monuments.

This important desert ecosystem in viewshed is visited by many millions of tourists and tourism related business people every year. They come from throughout the United States and many foreign countries. We and our customers know the Native Americans who consider this great desert home from Nevada, Arizona, and California.

Your bill would protect many miles of this important and unique desert wild country. Desert scientists consider this major desert ecosystem to be one of the most important pristine desert environments in the world. The bills protections for Native American important cultural sites is of permanent importance.

This large relatively undisturbed desert ecosystem is also a wonderful natural system for studying the effects of climate change on wildlife habitat and wildlife corridors.

We thank you for introducing this important legislation to protect an important part of our nation's wild heritage. We urge its passage.

Sincerely,

Paul F Smith

Owner, 29 Palms Inn

73950 Inn Avenue Twentynine Palms, CA 92277 * Phone 760.367.3505 Fax 760.367.4425 * www.29palmsinn.com

Santa Ana River Wash Plan Land Exchange Act

Supported by Public Officials, Organizations, and Stakeholder Groups from across California and the Nation.

PUBLIC OFFICIALS & LOCAL GOVERNMENT
- San Bernardino County
- City of Highland
- City of Redlands

WATER DISTRICTS
- San Bernardino Valley Municipal Water District
- East Valley Water District

ENVIRONMENTALISTS
- Endangered Habitats League

LOCAL BUSINESSES
- Cemex Construction Materials Pacific, LLC
- Robertson's Ready Mix

CIVIC GROUPS
- Inland Action

Updated – July 25, 2017

385 North Arrowhead Avenue, San Bernardino, CA 92415-0120 | Phone: 909.387-4821 Fax: 909.387-5430

SAN BERNARDINO COUNTY

County Administrative Office
Governmental & Legislative Affairs

Josh Candelaria
Director

March 31, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar:

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years, with full participation and support from the County of San Bernardino and the San Bernardino County Flood Control District. The U.S. Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive, long-term conservation program.

The County of San Bernardino supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley, totaling more than 4,500 acres. The plan will provide protection for 1,347 acres of habitat important for a number of threatened and endangered species; it allows the development of 15 miles of new public use trails, supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate, with continued mining yielding $36 million in local annual payroll and over $8.5 million in local community infrastructure construction.

If you have any questions, please contact Josh Candelaria, Director of Governmental and Legislative Affairs at (909) 387-4821 or jcandelaria@sbcounty.gov.

Sincerely,

JAMES RAMOS
Board of Supervisors Chairman
Third District Supervisor
County of San Bernardino

BOARD OF SUPERVISORS
ROBERT A. LOVINGOOD, Vice Chairman, First District
JANICE RUTHERFORD, Second District
JAMES RAMOS, Chairman, Third District
CURT HAGMAN, Fourth District
JOSIE GONZALES, Fifth District
GREGORY C. DEVEREAUX, Chief Executive Officer

City of HIGHLAND Inc. 1987

March 25, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar:

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The US Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

The City of Highland strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan will provide protection for 1,347 acres of habitat important for a number of Endangered Species, as well as, allows the development of 15 miles of new public use trails; supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

Sincerely,

Larry McCallon
Mayor, City of Highland

cc: Highland City Council
Joseph Hughes, Highland City Manager
Daniel Cozad, dcozad@sbvwcd.org
Angie Quiroga, aquiroga@sbvwcd.org

c:\users\bhughes\documents\my documents\cityofficials\wash plan land exchange support.docx

Mayor Larry McCallon | Mayor Pro Tem Penny Lilburn | City Council Sam J. Racadio | City Council Jody Scott | City Council John P. Timmer | City Manager Joseph A. Hughes

27215 Base Line, Highland, CA 92346
Tel: (909) 864-6861 • Fax: (909) 862-3180 • Web: www.cityofhighland.org

RESOLUTION NO. 2016-006

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF HIGHLAND, CALIFORNIA, SUPPORTING H.R. 4024, THE SANTA ANA RIVER WASH PLAN LAND EXCHANGE ACT

WHEREAS, the Santa Ana River Wash Plan will provide for habitat protection, commercial mining, recreation, and additional water recharge development in the Santa Ana Wash; and

WHEREAS, the plan will support local industries to take root and flourish while preserving our environment and regional wildlife habitat; and

WHEREAS, the plan protects and manages rare habitat communities along Santa Ana River while simultaneously ensuring compatible economic vitality; and

WHEREAS, the plan will provide for greater public access by the opportunity to establish trails to connect and complete the Santa Ana River Trail; and

WHEREAS, the Santa Ana River Wash Plan Land Exchange Act, will complete the land exchange between the Bureau of Land Management and the San Bernardino Valley Water Conservation District critical to the success of the plan; and

WHEREAS, this land swap will align local land ownership with appropriate uses, setting aside already disturbed nearby land for aggregate mining and preserving and improving important habitat for conservation of Federally endangered species; and

WHEREAS, Congressman Paul Cook and Congressman Pete Aguilar introduced the Santa Ana Wash Plan Land Exchange Act to complete this important plan that has been 15 years in the making.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF HIGHLAND, CALIFORNIA HEREBY RESOLVES, FINDS AND DETERMINES AS FOLLOWS:

Section 1. The City Council hereby specifically finds that all of the facts set forth in this Resolution are true and correct and resolves that they support H.R. 4024, the Santa Ana River Wash Land Exchange Act.

Section 2. The City Clerk shall certify to the adoption of this Resolution and deliver a copy to the San Bernardino Valley Water Conservation District and Congressman Paul Cook.

PASSED, APPROVED, and ADOPTED this 9th day of February, 2016.

Larry McCallon
Mayor

ATTEST:

Betty Hughes, MMC
City Clerk

c:\users\bhughes\documents\my documents\resorde\2016\res 16-06.docx

STATE OF CALIFORNIA)

COUNTY OF SAN BERNARDINO)

CITY OF HIGHLAND)

I, BETTY HUGHES, City Clerk of the City of Highland, California, do hereby certify Resolution No. 2016 - 006 was duly and regularly adopted by the City Council of the City of Highland, California, at a regular meeting thereof held on the 9th day of February, 2016, by the following vote:

AYES: Lilburn, McCallon, Racadio, Timmer

NOES: None

ABSTAIN: None

ABSENT: Scott

Betty Hughes

BETTY HUGHES, MMC
CITY CLERK

PAUL W. FOSTER
Mayor

City of
REDLANDS
Incorporated 1888
35 Cajon Street, Redlands, CA 92373
909-798-7533
pfoster@cityofredlands.org

JON HARRISON
Mayor Pro Tem

PAT GILBREATH
Council Member

PAUL BARICH
Council Member

JOHN E. JAMES
Council Member

March 17, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar:

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The US Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

The City of Redlands strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan will provide protection for 1,347 acres of habitat important for a number of Endangered Species, as well as, allows the development of 15 miles of new public use trails; supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

Sincerely,

Paul W. Foster
Mayor City of Redlands

Valley
2001 E. Vanderbilt Way
San Bernardino, CA 92408
phone: 909-887-7600
fax: 909-887-7467
www.sbvmwd.com

March 17, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The U.S. Fish and Wildlife Service and the U.S. Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

The San Bernardino Valley Municipal Water District strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4,500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan provides protection for 1,347 acres of habitat important for a number of endangered species, allow the development of 15 miles of new public use trails; supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

Sincerely,

Douglas D. Headrick

Douglas D. Headrick
General Manager

Board of Directors and Officers

ED KILLGORE	GIL NAVARRO	SUSAN LONGVILLE	MARK BULOT	STEVE COPELAN	DOUGLAS D. HEADRICK
Division 1	Division 2	Division 3	Division 4	Division 5	General Manager

RESOLUTION NO. 1036

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT IN SUPPORT OF H.R. 4024, THE SANTA ANA RIVER WASH PLAN LAND EXCHANGE ACT

WHEREAS, the Santa Ana River Wash Plan will provide for habitat protection, commercial mining, recreation, and additional water recharge development in the Santa Ana Wash; and

WHEREAS, the plan will support local industries to take root and flourish while preserving our environment and regional wildlife habitat; and

WHEREAS, the plan protects and manages rare habitat communities along Santa Ana River while simultaneously ensuring compatible economic vitality; and

WHEREAS, the plan will provide for greater public access by the opportunity to establish trails to connect and complete the Santa Ana River Trail; and

WHEREAS, the Santa Ana River Wash Plan Land Exchange Act, will complete the land exchange between the Bureau of Land Management and the San Bernardino Valley Water Conservation District critical to the success of the plan; and

WHEREAS, this land swap will align local land ownership with appropriate uses, setting aside already disturbed nearby land for aggregate mining and preserving and improving important habitat for conservation of Federally endangered species; and

WHEREAS, Congressman Paul Cook and Congressman Pete Aguilar introduced the Santa Ana Wash Plan Land Exchange Act to complete this important plan that has been 15 years in the making.

NOW, THEREFORE, BE IT RESOLVED, that the San Bernardino Valley Municipal Water District Board of Directors support H.R. 4024, the Santa Ana River Wash Land Exchange Act.

3982

ADOPTED at a regular meeting of the San Bernardino Valley Municipal Water District Board of Directors held on February 16, 2016.

San Bernardino Valley Municipal Water District

By: _____
Mark Bulot
President

ATTEST:

_____
Gil Navarro
Secretary

EAST VALLEY WATER DISTRICT

LEADERSHIP • PARTNERSHIP • STEWARDSHIP

BOARD OF DIRECTORS

Ronald L. Coats, President
Chris Carrillo, Vice President
James Morales, Jr., Director
Nanette Shelton, Director
David E. Smith, Director

John Mura, General Manager/CEO

February 19, 2016

Re: H.R. 4024
Position: Support

Dear Congressman Cook:

East Valley Water District (EVWD) supports H.R. 4024, as proposed.

The current drought emergency highlights the importance of responsible groundwater recharge. As an area with remaining open spaces that can be utilized by various entities, the proposed land exchange could result in a fair agreement to benefit the community.

EVWD is a California Special District that provides water and wastewater service to over 101,000 residents within its 27.7 square mile service area. EVWD was formed in 1954 through an election of local residents to have water service provided by a public water agency. With a water supply mix including groundwater, surface water from the Santa Ana River, and imported State Project Water, EVWD has a unique level of water service reliability.

The goal of H.R. 4024 is to authorize an exchange of land between the Bureau of Land Management and the San Bernardino Valley Water Conservation District (Conservation District). As an agency located within the service area of the Conservation District, we work in cooperation to recharge the Bunker Hill Groundwater Basin. As the District's primary source of water supply we recognizes the importance of ensuring responsible recharge and ensuring that available land be put to the most beneficial use. This item is an example of two public service organizations working together to maximize resources for the greater good.

Please contact me with any questions or comments.

Sincerely,

John Mura
General Manager/CEO

31111 Greenspot Road, Highland, CA 92346 | Ph. 909-889-9501 | www.eastvalley.org

ENDANGERED HABITATS LEAGUE
DEDICATED TO ECOSYSTEM PROTECTION AND SUSTAINABLE LAND USE

March 19, 2015

VIA ELECTRONIC MAIL

The Honorable Paul Cook
1222 Longworth HOB
House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
House of Representatives
Washington, DC 20515

RE: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar:

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The US Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

Endangered Habitats League, Southern California's only regional conservation group, strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project.

This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan will provide protection for 1,347 acres of habitat important for a number of Endangered Species, as well as, allows the development of 15 miles of new public use trails; supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

If you have any questions or need additional information, please contact the undersigned.

Yours truly,

Dan Silver
Executive Director

8424 SANTA MONICA BLVD SUITE A 592 LOS ANGELES CA 90069-4267 ♦ WWW.EHLEAGUE.ORG ♦ PHONE 213.804.2750

CEMEX

March 25, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The US Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

CEMEX Construction Materials Pacific, LLC strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan will provide protection for 1,347 acres of habitat important for a number of Endangered Species, as well as, allow for the development of 15 miles of new public use trails; support the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allow for the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

If you have any questions or need additional information, please contact me at 909-974-5471 or by email at christinem.jones@cemex.com.

Sincerely,

Christine Jones

Christine Jones
Permit Manager

cc: Daniel Cozad, SBVWCD

Southern California Operations
3990 E. Concours Street, Suite 200, Ontario, CA 91764 , (909) 974-5500, Dispatch (800) 801-ROCK, Fax (909) 974-5524

ROBERTSON'S

ROCK · SAND · BASE MATERIALS
READY MIX CONCRETE

March 16, 2015

The Honorable Paul Cook
1222 Longworth HOB
United States House of Representatives
Washington, DC 20515

The Honorable Pete Aguilar
1223 Longworth HOB
United States House of Representatives
Washington, DC 20515

Subject: Support for Wash Plan Land Exchange Bill

Dear Congressmen Cook and Aguilar

As you are aware, the San Bernardino Valley Water Conservation District and the Upper Santa Ana River Wash Plan Task Force have been working on the Wash Plan Habitat Conservation Plan for many years. The US Fish and Wildlife Service and the US Bureau of Land Management recently noticed their intent to prepare the environmental documents to complete this comprehensive long term conservation program.

The Robertson's strongly supports the Wash Plan implementation and your sponsorship of legislation to facilitate the land exchange necessary for the completion of this project. This multi-agency collaborative project is designed to provide thoughtful land use on one of the largest open areas in the eastern San Bernardino Valley totaling over 4500 acres. The Wash Plan area is located at the confluence of the Santa Ana River and Mill Creek. The plan will provide protection for 1,347 acres of habitat important for a number of Endangered Species, as well as, allows the development of 15 miles of new public use trails; supports the recharge of local groundwater aquifers through the operation of more than 77 recharge basins, and allows the production of local aggregate with continued mining yielding $36 M in local annual payroll and over $8.5 M in local community infrastructure construction.

If you have any questions or need additional information, please contact Christine Goeyvaerts at Robertson's.
Christineg@rrmca.com (e-mail)
(951) 760-4241 (Cell) or
(951) 685-4600 Xt 6283 (office)

Christine Goeyvaerts
Property Manager
Robertson's

P.O. Box 3600 • Corona, California 92878-3600
(951) 493-6500 • Fax (951) 493-6442

InlandAction

February 2, 2016

Senator Dianne Feinstein
331 Hart Senate Office Building
Washington, DC 20510

Dear Senator Feinstein,

The members of Inland Action ask for your support of the Santa Ana River Wash Plan. We believe the Wash Plan Task Force has found balance in the Upper Santa Ana River Wash Plan. This plan calls for a land exchange in order to create habitat for sensitive and endangered species, to allow for future mining, to facilitate benefits for local infrastructure projects, and for trails and water recharge projects. This plan represents more than 15 years of negotiations and planning. It involved countless discussions among environmentalists, business interests, government and community to come up with an approach to the Wash Area that would protect the interests of all parties.

The plan is comprehensive and identifies land where existing mining operations can expand and continue to provide the aggregate needed to support the region's growing construction industry. Additionally, it establishes protected areas for native plants and animals under the Endangered Species Act.

In November, the Santa Ana River Wash Plan Land Exchange Act, (H.R. 4024), a bi-partisan bill, was introduced by Congressman Pete Aguilar and Congressman Paul Cook to facilitate the exchange of District and Bureau of Land Management parcels. This critical component is as important to the habitat elements as it is to the activities covered by the plan. We fully support the Wash Plan and ask that you introduce companion legislation in the Senate and support its timely consideration.

The Wash Plan effort has been under study since the late 1980s. We are proud that continued work and discussions have produced a compromise between cities, local agencies, industry, and Federal and State resources agencies that will continue to support Inland Empire communities, businesses and transportation projects, while safeguarding essential habitat areas in perpetuity. With so many stakeholders involved in the process, the Santa Ana River Wash Plan Land Exchange Act serves as a model for collaboration between federal, state and local entities.

We thank you for your continued support for our region.

Sincerely,

Carole Beswick

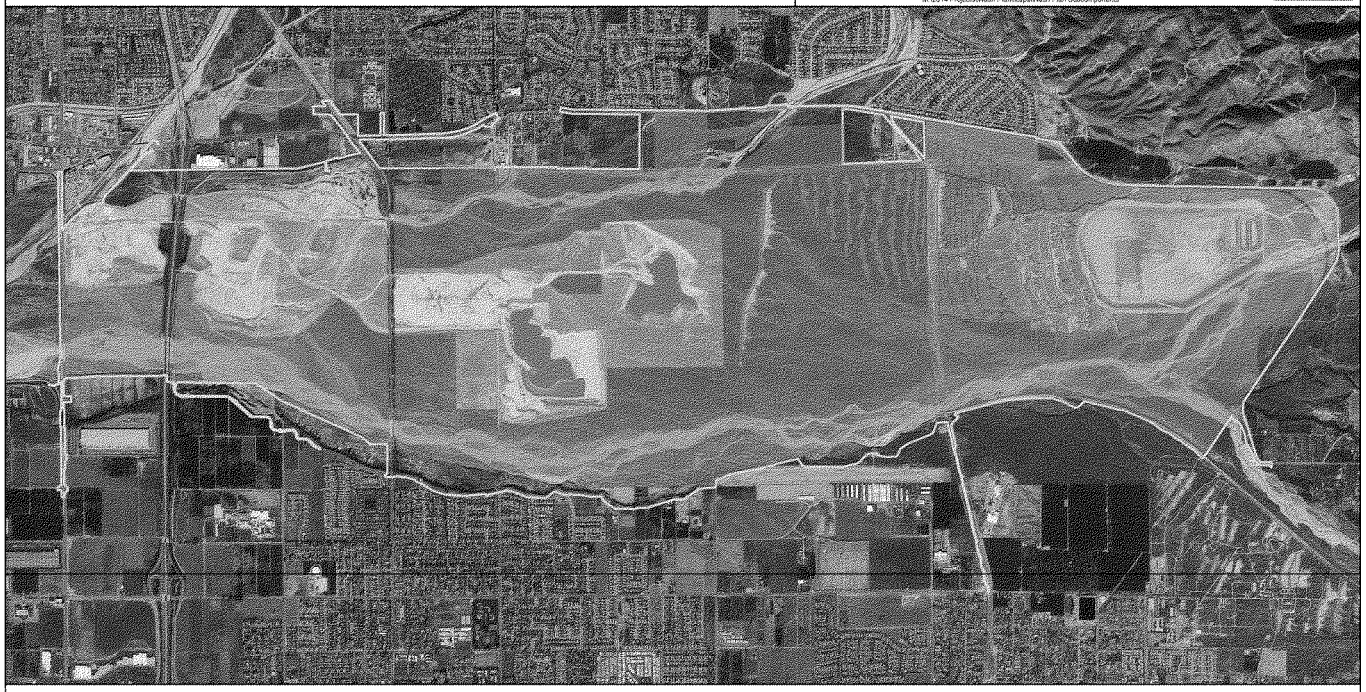
Carole Beswick, CEO

114 South Del Rosa Drive, 106B, San Bernardino, CA 92408 | Tel. 909-382-4018 | Fax. 909-792-8742 | www.InlandAction.com

Wash Plan Subcomponents

Coordinate System: StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
Scale: 1:24,000
Source: SBVWCD GIS
GIS Contact: Erin Berger and Katelyn Scholte
M:\2014 Projects\Wash Plan\Maps\Wash Plan Subcomponents

May 4, 2015



LEGEND

- WATER CONSERVATION (869 ACRES)
- CONSERVATION (2,371 ACRES)
- MINING (1,087 ACRES)
- WASH PLAN BOUNDARY

TOTAL WASH PLAN ACREAGE: 4,837 *All acreages are approxomate*

0 0.25 0.5 1 1.5 2 Miles

GREATERYELLOWSTONE.ORG
LOCATIONS IN MONTANA, IDAHO & WYOMING

HEADQUARTERS
215 South Wallace Avenue
Bozeman, Montana 59715
406.586.1593

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

July 24, 2016

Dear Chairman Murkowski and Ranking Member Cantwell:

Please accept the following 34-page report and accompanying 2-page fact sheet into the official record for the July 26, 2017 Senate Committee on Energy and Natural Resources hearing on the Yellowstone Gateway Protection Act, S.941.

References:

- Earthworks, *US Copper Porphyry Mines: The Track Record of Water Quality Impacts Resulting from Pipeline Spills, Tailings Failures, and Water Collection and Treatment Failures*. July 2012 (Revised November 2012). Available at: https://www.earthworksaction.org/library/detail/us_copper_porphyry_mines#.WXZXk_5hnRY

- Earthworks, *Copper Sulfide Mining: The Track Record of Water Quality Impacts Resulting from Pipeline Spills, Tailings Failures, and Water Collection and Treatment Failures*. Summary of report findings. November 2012.

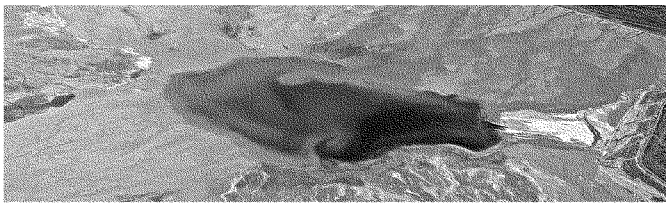
Emigrant Gulch is formally known as a "copper gold porphyry deposit." These are exactly the same type of deposits analyzed in the submitted copper porphyry report (and the fact sheet).

It is important to note that the mines in this report are currently operating U.S. mines subject to existing state and federal regulations, often referred to a "modern mining methods." They were all predicted to meet or exceed water quality and safety standards or else they would not have been permitted. Yet 100% of these mines experience pipeline spills or other accidental releases and a staggering 92% failed to control contaminated mine seepage, resulting in significant water quality impacts.

Respectfully Submitted,

Joe Josephson
Montana Conservation Associate
Greater Yellowstone Coalition

AMERICA'S VOICE FOR A GREATER YELLOWSTONE



COPPER SULFIDE MINING:

THE TRACK RECORD OF WATER QUALITY IMPACTS RESULTING FROM PIPELINE SPILLS, TAILINGS FAILURES AND WATER COLLECTION AND TREATMENT FAILURES.

A peer-reviewed study of the track record of water quality impacts from operating U.S. copper sulfide mines found severe impacts to drinking water aquifers, contamination of farmland, contamination and loss of fish and wildlife and their habitat, and risks to public health.[1] In some cases, water quality impacts were so severe that acid mine drainage at the mine site will generate water pollution in perpetuity.

Report findings:

In 2012, state and federal documents were reviewed for fourteen copper sulfide mines representing 89% of U.S. copper production in 2010 – the most recent data on copper production available from the U.S. Geological Survey. These mines provided a representative view of the types of environmental impacts resulting from the development of copper sulfide deposits, focusing on pipeline spills, tailings failures and water collection and treatment failures.

The report found that:

- **All of the mines (100%) experienced pipeline spills or other accidental releases.**

  The most frequent spills were reported at the Ray Mine in Arizona, where over fifty pipeline spills occurred from 1988 to 2012. Examples of recent pipeline spills include a 2012 spill at the Morenci Mine of 186,000 gallons of sulfuric acid along two miles of Chase Creek - a tributary of the San Francisco River, and a 2009 spill of 2 million gallons of process water at the Bagdad Mine.

- **At 13 of the 14 mines (92%), water collection and treatment systems have failed to control contaminated mine seepage, resulting in significant water quality impacts.**

  The development of acid mine drainage was associated with the most severe and lasting impacts. For example, the Tyrone and Chino mines – the two largest copper mines in New

[1] Earthworks, U.S. Copper Porphyry Mines: The Track Record of Wter Quality Impacts Resulting from Pipeline Spills, Tailings Failures, and Water Colleciton and Treatment Failures, July 2012 (Revised November 2012). Available at:

EARTHWORKS™

EARTHWORKS • 1612 K St., NW, Suite 808 Washington, D.C., USA 20006
www.earthworksaction.org • bgestring@earthworksaction.org • 406-549-7361

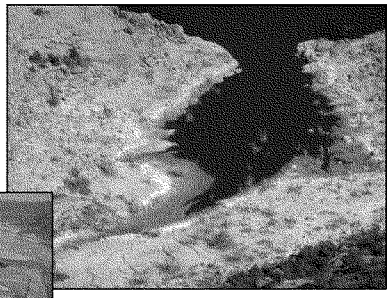
Mexico, will generate an estimated 2 billion gallons of acid and metals contaminated seepage every year, requiring water treatment in perpetuity. These two mines have resulted in severe surface and groundwater contamination, and the State of New Mexico and U.S. Department of Justice have filed natural resource damage claims against the company for damages to water and wildlife resources.

The Bingham Canyon Mine, the largest open pit copper mine currently operating in the United States, will also generate water pollution in perpetuity from the mine's waste rock piles. Mine operations have resulted in a plume of contaminated groundwater extending over 70 square miles, and the State of Utah filed a natural resource damage claim against the mine in 2008 for impacts to water and wildlife resources.

- **Tailings spills have occurred at nine operations, and a partial failure of the tailings impoundment occurred at four out of fourteen mines (28%).**

These included a 1997 partial failure of the tailings impoundment at the Pinto Valley Mine, where the creek bed and surrounding upland were buried under material as deep as 42 feet. In 1993, heavy precipitation caused the Gila River to flood and breach the tailings impoundment at the Ray Mine, carrying pollutants 11 miles downriver. And in 1980, 2.6 million cubic yards of tailings were released at the Tyrone mine, and flowed 8 kilometers downstream.

Many of the currently operating copper sulfide mines are located in the arid southwest, where precipitation is limited, and communication between surface and groundwater resources is limited. More significant impacts could be expected at mines in wetter climates, with abundant surface water and shallow groundwater. Research shows that mines with high acid generating potential and in close proximity to surface and groundwater are at highest risk for water quality impacts.



Mine pollution at Arizona copper mine.

Tailings pond at copper sulfide mine.

U.S. Copper Porphyry Mines

Report

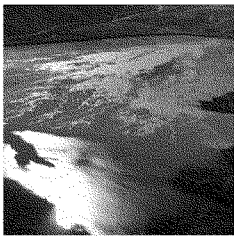
THE TRACK RECORD OF WATER QUALITY IMPACTS RESULTING FROM PIPELINE SPILLS, TAILINGS FAILURES AND WATER COLLECTION AND TREATMENT FAILURES.

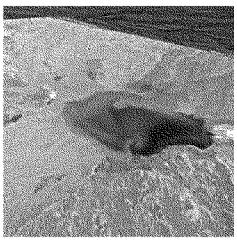
JULY 2012
(REVISED 11/2012)

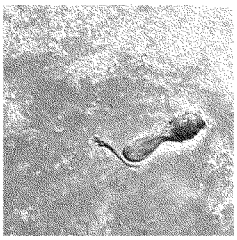
EARTHWORKS

U.S. COPPER PORPHYRY MINES:

The track record of water quality impacts resulting from pipeline spills, tailings failures and water collection and treatment failures.







EARTHWORKS, July 2012

(Revised 11/2012)

By Bonnie Gestring

Reviewed by Dave Chambers Ph. D.,
Center for Science in Public Participation (CSP2)

Photos, top to bottom:

Yankee Doodle tailings pond by Ecoflight
Chino Mine by Gila Resource Information Project (GRIP)
Sierrita Mine by Ecoflight
Bird fatality at Tyrone Mine by Jim Kuipers

Table of Contents

Introduction, Methods, & Results 4

Conclusion 5

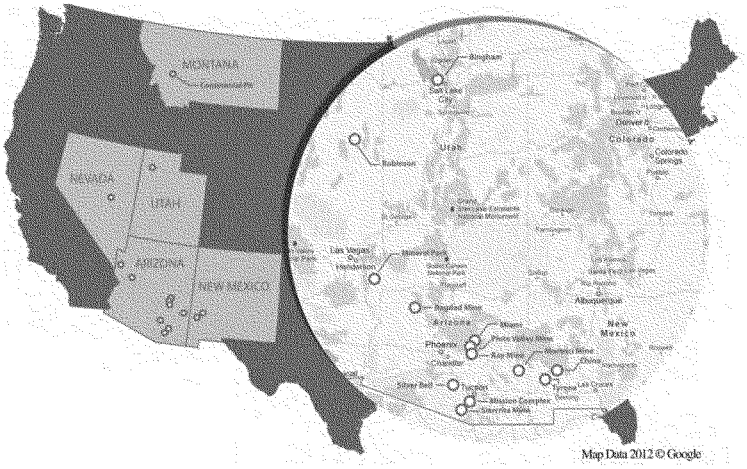
Table 1: Copper production amounts for mines reviewed in the report 6

Table 2. Synopsis of pipeline spills, tailings spills and impoundment failures, and water capture and treatment failures for 14 copper porphyry mines (1986-2012) 7

Case Studies of Active U.S. Copper Porphyry Mines

- Morenci Mine, AZ 8
- Bingham Canyon, UT 10
- Ray Mine, AZ 12
- Chino Mine, NM 15
- Bagdad Mine, AZ 17
- Sierrita Mine, AZ 18
- Pinto Valley Mine, AZ 20
- Mission Complex, AZ 22
- Robinson, NV 23
- Tyrone, NM 24
- Miami, AZ 26
- Silver Bell, AZ 27
- Mineral Park, AZ 28
- Continental Pit, MT 29

References 30



INTRODUCTION:

The Pebble Mine is proposed for development at the headwaters of the Bristol Bay watershed in southwest Alaska, which supports the world's largest wild sockeye salmon fishery. According to current ore estimates, the Pebble Mine would be the largest copper porphyry mine in the U.S., if constructed.

Currently, the U.S. Environmental Protection Agency (EPA) is completing a watershed assessment to evaluate the potential impacts of large-scale mining on water quality and fishery resources using a mine scenario that reflects the expected characteristics of mining operations at the Pebble deposit.

The purpose of this report is to compile the record of pipeline, seepage control and tailings impoundment failures at operating copper porphyry mines in the U.S., and to document associated water quality impacts.

Copper porphyry is a form of copper deposit that is often characterized as low-grade, typically with 0.4% and 1.0% concentration of copper, and containing other minerals such as gold, molybdenum, and other trace elements in the ore body. Copper porphyry deposits are almost always mined in industrial-scale open pit operations.

Contact water drainage from porphyry deposits commonly has concentrations of aluminum, cadmium, copper, iron, manganese, lead, and zinc that exceed US drinking-water limits, which were developed to protect public health, and also commonly exceeded for cadmium, copper, lead and zinc aquatic life standards, developed to protect fish and other sensitive aquatic organisms.[1]

METHODS:

We reviewed state and federal documents and a federal database for fourteen copper porphyry mines currently operating in the U.S. with respect to three failure modes: pipeline spills or other accidental releases, tailings spills or tailings impoundment failures, and failure to capture and treat mine seepage.

The 14 mines represent 87% (14 out of 16) of currently operating copper porphyry mines, and 89% of U.S. copper production in 2010 – the most recent data on copper production available from the U.S. Geological Survey. The mines were chosen based on an operating record of more than five years. These mines provide a representative view of the types of environmental impacts resulting from the development of copper porphyry deposits, focusing on pipeline spills, tailings failures, and water collection and treatment failures.

RESULTS:

Our research shows that copper porphyry mines are often associated with water pollution associated with acid mine drainage, metals leaching and/or accidental releases of toxic materials. We found that all of the mines experienced at least one failure, with most mines experiencing multiple failures:

- At 14 of the 14 mines (100%), pipeline spills or other accidental releases occurred. The most frequent spills were reported at the Ray Mine in Arizona, where over fifty pipeline spills occurred from 1988 to 2012. Examples of recent pipeline spills include a 2012 spill at the Ray Mine which washed tailings into the Gila River, and a 2008 pipeline spill at the Morenci Mine of 186,000 gallons of sulfuric acid along two miles of Chase Creek - a tributary of the San Francisco River.

- At 13 of the 14 mines (92%), water collection and treatment systems have failed to control contaminated mine seepage, resulting in significant water quality impacts. The development of acid mine drainage was associated with the most severe and lasting impacts. For example, at the Tyrone and Chino mines – the two largest copper porphyry

mines in New Mexico, seepage from tailings impoundments and waste rock piles have resulted in surface and/or groundwater pollution. The State of New Mexico and U.S. Department of Justice have filed natural resource damage claims against the company for damages to water, fish and wildlife resources.

- At 4 out of 14 mines (28%), partial tailings impoundment failures have occurred, and at 9 out of 14 mines (64%), tailings spills have occurred. These included a 1997 partial failure of the tailings impoundment at the Pinto Valley Mine, where 8.1 acres of creek bed and surrounding upland were buried under material as deep as 42 feet. In 1993, heavy precipitation caused the Gila River to flood and breach the tailings impoundment at the Ray Mine, carrying pollutants 11 miles downriver. And in 1980, 2.6 million cubic yards of tailings were released at the Tyrone mine, and flowed 8 kilometers downstream.

CONCLUSION:

Our research shows that water quality impacts to surface and/or groundwater are common at currently operating copper porphyry mines in U.S., resulting from three failure modes (pipeline spills or other accidental releases, failure to capture and treat mine seepage, and tailings spills or impoundment failures).

These failures resulted in a variety of environmental impacts, such as contamination of drinking water aquifers, contamination and loss of fish and wildlife and their habitat, and risks to public health. In some cases, water quality impacts are so severe that acid mine drainage will generate water pollution in perpetuity.

This research demonstrates that the three failure modes identified in the Bristol Bay watershed assessment with respect to risks to water quality are reasonable and well-supported by the track record of operating copper porphyry mines in the U.S.

Many of the currently operating copper porphyry mines are located in the arid southwest, where precipitation is limited, and communication between surface and groundwater resources is limited. While beyond the scope of the analysis in this report, more significant impacts could be expected at mines in wetter climates, with abundant surface water and shallow groundwater, such as is the case in the Bristol Bay region. Research shows that mines with high acid generating potential and in close proximity to surface and groundwater are at highest risk for water quality impacts.[2]

Table 1

2010 copper production amounts for mines reviewed in this report.

Mine	Location	Company	2010 Copper production (Metric Tons)
Bingham Canyon	UT	Kennecott/Rio Tinto	250,000[3]
Morenci	AZ	Freeport	233,146[4]
Ray	AZ	ASARCO	105,051[5]
Bagdad	AZ	Freeport	92,079[6]
Mission	AZ	ASARCO	83,415[7]
Sierrita	AZ	Freeport	66,678[8]
Robinson	NV	Quadra	49,400[9]
Tyrone	NM	Freeport	37,194[10]
Silver Bell	AZ	ASARCO	21,000[11]
Chino	NM	Freeport	15,400[12]
Mineral Park	AZ	Mercator	14,605[13]
Miami	AZ	Freeport	8,100[14]
Pinto Valley	AZ	BHP	6,000[15]
Continental Pit	MT	Montana Resources	Not available
Total production of 13 mines			982,068
Total U.S. production			1,100,000
Percent of total production			89%

Table 2

Synopsis of pipeline spills, tailings spills and impoundment failures, and water capture and treatment failures for 14 copper porphyry mines (1986-2012).

Mine	Number of reported pipeline spills and other accidental releases*	Water collection and treatment failures	Tailings dam failures	Affected surface and/or ground water
Morenci	21	Yes		San Francisco River, Gila River, Chase Creek, groundwater aquifer
Bingham Canyon	28	Yes		72 square mile plume of contaminated groundwater; fish and wildlife habitat in the Great Salt lake ecosystem
Ray	54	Yes	Partial	Mineral Creek, Gila River, groundwater aquifer
Chino	10	Yes		Hanover/Whitewater Creek, contaminated groundwater will require water treatment in perpetuity
Bagdad	7	Yes	Partial	Boulder Creek, Burro Creek, Butte Creek, Bridle Creek
Sierrita	18	Yes		Demetrie Wash and its tributaries; groundwater aquifer including drinking water wells in Green Valley
Pinto Valley	3	Yes	Partial	Pinto Creek
Mission	3	Yes	Partial	Tributaries of the Santa Cruz River, groundwater aquifer
Robinson	8	Unknown		2.3 miles of downstream drainage bed
Tyrone	7	Yes	Partial	Mangas Creek, groundwater contamination will require water treatment in perpetuity
Mineral Park	3	Yes		Groundwater aquifer and surface water
Miami	8	Yes		Pinal Creek alluvial aquifer
Silver Bell	3	Yes		Cocio Wash
Continental Pit	2	Yes		Groundwater aquifer

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

CASE STUDIES:

MORENCI MINE, AZ (Freeport McMoRan) The Morenci Mining District is located in southeastern Arizona, near the towns of Clifton and Morenci. It is located near the Gila River, the San Francisco River and Eagle Creek.	
Reports of pipeline failures and other accidental releases*	2008: Report of pipeline spill releasing 186,000 gallons of sulfuric acid and heavy metals into a tributary (Chase Creek) of the San Francisco River, resulting in a $150,000 settlement with the State of Arizona.[16] The highly acidic material traveled downstream more than 2 miles. The pollutants in the discharge exceeded Arizona surface water quality standards for copper, zinc and pH in Lower Chase Creek. 2007: Report of release of 1,200,000 gallons of pregnant leach solution released due to power failure.[17] 2006: Report of release of 3,000 pounds of sulfuric acid from pipeline break.[18] 2006: Report of 1,127 pounds of material from PLS pipeline.[19] 2006: Report of release of rich electrolyte (acid content 1,057 pounds) from an underground process pipeline.[20] 2004: Report of release of 8,920 pounds of sulfuric acid and water from process pipeline due to failure of valve.[21] 2001: Report of release of 6,350 pounds of sulfuric acid released from pipeline.[22] 2000: Report of release of 72,000 gallons of sulfuric acid released from pipeline.[23] 1998: Report of release of 66,200 pounds of sulfuric acid released from pipeline.[24] 1996: Report of release of unknown amount of pregnant leach solution spilled from pipeline, affecting Chase Creek, leading to San Francisco River.[25] At the time of report, 20 gpm were being released. 1996: Report of release of 160,000 gallons of process solution spilled due to pipeline weld failure.[26] 1996: Report of release of 50,000 pounds of sulfuric acid spilled due to backhoe hitting pipeline.[27] 1996: Report of 12,435 pounds of sulfuric acid released from pipeline.[28] 1995: Report of 2,980 pounds of sulfuric acid released from pipeline.[29] 1994: Report of 203,400 gallons of raffinate released due to ruptured pipe.[30] 1994: Report of 5,400 pounds of sulfuric acid released due to fractured weld in pipeline.[31] 1993: Report of unknown amount of copper sulfate released into San Francisco River due to storm event.[32] 1993: Report of 180,000 gallons of pregnant leach solution spilled due to plugged drain line, affected 1 acre.[33] 1992: Report of 2,500 gallons of electrolyte released.[34] 1992: Report of 15,000 pounds of copper sulfate spilled due to valve failure.[35] 1992: Report of 7,500 gallons of electrolyte spilled due to failure of pipeline weld.[36]
Water collection and treatment failures	In 2012, the U.S. Dept of Justice and the State of Arizona released a consent decree which found that, "mine tailings exposed to air and precipitation released hazardous substances on the surface of the tailings or that can percolate through the tailings to groundwater." The consent decree found that, "releases of hazardous substances at or from the Morenci mine site have occurred and allege that such releases have caused injuries to natural

	resources at and in the vicinity of the site including surface water, sediments, soils, terrestrial habitats and terrestrial receptors."[37] A financial settlement followed an investigation of natural resource injuries related to the release of hazardous substances into the environment from acid mine drainage and process solution, among other sources. The investigation found that the main ore minerals are sulfide minerals, which have resulted in the development of acid mine drainage. According to the report, "Surface water has been, and most likely continues to be, exposed to hazardous substances released from the Morenci Mine through a variety of pathways."[38] Concentrations of hazardous substances measured in groundwater at the Morenci Mine and measured in the San Francisco and Gila Rivers downstream of the mine provide further indications that hazardous substances present in the source materials at the Morenci Mine have been released to the environment. The report found that "Concentrations of total and dissolved zinc have exceeded 1,000 ug/l in the Gila River and concentration of dissolved copper have exceeded 100 ug/l in the San Francisco River."[39] Contaminated groundwater is also released to surface water via seeps and springs.[40]
Tailings spills and impoundment failures	No impoundment failures.
Impacts to water, fish and wildlife	In 2012, the US Department of Justice and Department of Interior have jointly announced that Freeport McMoRan has agreed to pay $6.8 million to settle federal and state natural resource damages related to the Morenci Mine. According to the complaint, the hazardous substance release, which included sulfuric acid and metals, injured, destroyed or led to the loss of "surface waters, terrestrial habitat and wildlife, and migratory birds."[41] As described above, metals contamination occurred in the San Francisco and Gila Rivers downstream of the mine, and to groundwater supplies.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

BINGHAM CANYON MINE and SMELTER, UT (Kennecott) The Bingham Canyon Mine is the deepest open pit mine in the world, located southwest of Salt Lake City, Utah.	
Reports of pipeline failures and other accidental releases*	2011: Report of malfunction of equipment that allowed the release of approximately 145,424 gallons of copper tailings.[42] 2011: Report of pipeline overflow onto soil with estimated 100,000 – 290,000 gallons of copper tailings material released from pipeline.[43] 2011: Report of tailings slurry released from tailings slurry hot box. 160,000 gallons of tailings released.[44] 2010: Report of a release of process water due to broken pipeline. 2010: Report of a discharge of sulfuric acid from a pipeline in the precious metal plant released between 4,000-5,000 gallons.[45] 2007: Report of a release of 35,000 gallons of hydromet tails containing arsenic due to pipeline break.[46] 2007: Report of 1,240,000 gallons of process water containing arsenic from pipeline break due to cold temperatures. [47] 2006: Report of 270,000 gallons of process water released because of pump failure, which resulted in overflow of containment area.[48] 2006: Report of 660,000 gallons of process water containing arsenic released due to cracked pipe.[49] 2006: Report of 1,000,000 gallons of process water released from the Magna Reservoir due to a failed level indicator.[50] 2004: Report of 4,000,000 gallons of process water with arsenic from pipeline.[51] 2004: Report of 2,000,000 gallons of process water with arsenic from broken process water line.[52] 2004: Report of 202,000 gallons of process water released due to pipeline failure.[53] 2003: Report of 70,000 gallons of process water with arsenic released due to pipeline failure.[54] 2003: Report of 70 tons of copper concentrate released from pipeline.[55] 2003: Release of copper concentrate, containing 340 pounds of arsenic, 20,000 pounds of copper, and 200 pounds of lead.[56] 2003: Copper concentrate pipeline ruptured, releasing 240,000 tons of copper, 428 tons of arsenic, 253 tons of lead.[57] 2002: Report of 5,800 gallons of process water from slag pot cooling area due to plugged drain line.[58] 2001: Report of tailings pipeline failure, releasing 4 pounds of arsenic, 14 pounds of chromium and 1 pound of lead.[59] 2000: Report of 110 tons of ore slurry released due to a leak in ore line.[60] 2000: Report of 18,000 tons of sulfuric acid released from pipe due to flange failure.[61] 1999: The process water pipeline sprung a series of leaks in 1989 and 1999. It has been estimated that 100 million gallons of process water with high arsenic levels spilled before the leak was discovered.[62] 1998: Report of copper sulfate released into a canal. 1998: Report of clogged piping system causing pipe to back up and overflow releasing acid

	rock drainage into water. 1997: Report of settling pond overflow due to clogged outlet valve. Release of copper sulfate into water. 1997: Report of pipeline rupture releasing process water (pH 2.5-4.0) into water. 1993: Report of 45,000 gallons of wastewater spilled due to a rupture of the transfer line.[63] 1991: Report of 30,000 gallons of industrial wastewater spilled at the wastewater treatment plant due to line break.[64]
Water collection & treatment failure	2011: Noncompliance in April-June 2011 for discharges of copper, zinc and total suspended solids at copper smelter.[65] Wastewater from the mine has escaped the site's collection system, contaminating groundwater with acid, metals and sulfates. The groundwater plume extends towards the nearby Jordan River and covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[66] There have been multiple tailings spills.[67] Drainage from the waste rock piles will require water treatment in perpetuity to prevent additional groundwater pollution.[68] In February 2008, the United States Fish and Wildlife Service took legal action against Kennecott for the release of hazardous substances from the mine's facilities, including selenium, copper, arsenic, lead, zinc and cadmium.[69] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that serve as fish and wildlife habitats. According to the federal biologists, the release of these hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.[70]
Impacts to water, fish and wildlife.	In February 2008, the United States Fish and Wildlife Service took legal action against Kennecott for the release of hazardous substances from the mine's facilities, including selenium, copper, arsenic, lead, zinc and cadmium.[71] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that serve as fish and wildlife habitats. According to the federal biologists, the release of these hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

RAY MINE and HAYDEN SMELTER, AZ (ASARCO) The Ray Mine is a copper mining facility of approximately 6,100 acres near Kelvin, Arizona which discharges into Mineral Creek, a tributary of the Gila River, and the Hayden Facility is a smelting facility located in Hayden Arizona along the Gila River.	
Reports of pipeline failures and other accidental releases*	2012: Potable water line ruptured, which washed tailings into the Gila River. [72] 2007: A leak from a coupling in a tailings pipeline spilled tailings onto the banks and into the Gila River. A $20,000 civil penalty was paid.[73] According to the report, the pipeline had been in use since the construction of "d" tailings impoundment (about 1985), was in good condition, and was visually inspected on a frequent basis. A support structure failed on Feb. 4, 2007, resulting in an angular deflection at one of the couplings, resulting in the tailings leak.[74] 2007: Report of 1,000 pounds of sulfuric acid spilled from pipeline.[75] 2006: Report of 600 gallons of sulfuric acid spilled due to piping failure inside of mine.[76] 2000: Report of 80.95 pounds of copper sulfate released from basin/dam into Mineral Creek.[77] 2000: Report of 200 gallons of copper sulfate spilled from pipe.[78] 1999: Report of 33,000 gallons of tailings water released from pipeline.[79] Between August 1988 and November 1997, 47 separate releases of hazardous substances into Mineral Creek from the Ray Mine were reported.[80] According to a 2012 ecological risk assessment prepared by the State of Arizona, "A large portion of these releases were uncontained and eventually entered Mineral Creek and the Gila River. Hazardous chemicals released included copper sulfate, copper tailings and leachate."[81] In addition, the report found that multiple groundwater wells downgradient of the Ray Mine were found to be highly contaminated by a common leachate solution which was attributed to releases to shallow groundwater along Mineral Creek, and it concluded that "it is likely that the hazardous substances present in shallow groundwater will represent an ongoing source of chronic contamination to Mineral Creek (Lipton 2009)."[82] According to a report by the U.S. EPA, at least 19 spills of hazardous materials were reported at the Ray Mine from August 1990 through November 1993.[83] The majority of spills were from dams, pipelines, and ponds. The discharges typically resulted from either accidental discharges associated with heavy rain or from chronic seepage from leaching facilities into the ground water, which then entered the creek. The report found that, "surface water quality has been significantly affected." A total of 41 violations of total copper, dissolved copper, and beryllium numeric surface water quality standards were documented by the Arizona Department of Environmental Quality (ADEQ), EPA, and ASARCO in Mineral Creek below the Ray Mine.[84] According to the report, "Arizona's Department of Game and Fish believes that the discharges from the Ray Unit have negatively affected both the water quality and the aquatic life of Mineral Creek. The Department conducted a biosurvey of Mineral Creek in July 1993. In a report dated September 30, 1993, the Department found that although the numbers and diversity of aquatic insects and fish were high above the Ray Unit, an almost complete absence of aquatic life at sampling stations was observed directly downstream of the mine."[85]
Water collection and	According to an EPA report, "The mine's routine operations are chronically affecting the quality of both surface and ground waters in the mine's vicinity."[86] According to the report, the Arizona Dept. of Environmental Quality reported in 1996 that approximately

treatment failures	one-half mile of the Mineral Creek streambed below the Ray Mine was visibly affected by mine activities. The streambed was coated with a blue-green layer of copper oxides.[87] In April 1995, EPA reported that six ground water wells situated downgradient of the electrowinning plant and the electrowinning dam were continuously pumping PLS.[88] Multiple groundwater wells were found to be highly contaminated by a common leachate solution which was attributed to releases by ASARCO into shallow groundwater along Mineral Creek. It concluded that it is likely that the hazardous substance present in shallow groundwater will represent an ongoing source of chronic contamination to Mineral Creek (Lipton 2009).[89]
Tailings spills and impoundment failures	2012: Seepage from the tailings impoundment was released into two catch basins and into a tributary of the Gila River.[90] At the time of the report, seepage into the tributary was estimated at 75 gpm. The incident occurred as a result of operator error during the initiation of a new upstream construction method at its Elder Gulch Tailings Impoundment in 2011.[91] A delay in the completion of the tailings distribution line resulted in the uneven distribution of the tailings, which in turn caused the ponded water to migrate, and eventually be released from the impoundment into drainages.The seep was discovered on January 30, 2012, and seep flow from the embankment was observed to have stopped on February 7, 2012. 2011: A report of 6,000-8,000 tons of copper ore tailings released from one of the tailings pond due to a breach in the dike.[92] The company failed to operate and maintain all listed permitted facilities in its Aquifer Protect Permit No. P-100507 to prevent the unauthorized discharge of copper ore tailings.[93] In 1993, heavy precipitation caused the Gila River to flood, and breach the AB-BC tailings impoundment containment dike.[94] According to a report by the U.S. EPA, "Continued flooding over the next several days resulted in a total of 13 separate breaches of the dike, three of which eroded through the dike and into the toe of the tailings pile. The total discharge was approximately 292,000 tons of tailings, which was about 216,000 cubic yards of material."[95] It also found that sampling of the river showed that elevated concentrations of pollutants occurred at least 11 miles downstream of the spill. The tailings formed bank and bottom deposits in the river, impairing both recreational uses and the quality of habitat for plants and animals.[96]
Impacts to water, fish and wildlife	In April 2009, the Department of the Interior and the State of Arizona, acting as natural resource trustees (Trustees) received a monetary settlement and three parcels of land from ASARCO, L.L.C. through the Natural Resource Damage Assessment and Restoration (NRDAR) program to account for injuries to trust resources incurred through multiple releases of hazardous substances by ASARCO L.L.C. into Mineral Creek and the Gila River in Pinal County, Arizona.[97] According to a 2012 ecological risk assessment by the State of Arizona, "The site of injury stretches from the Ray Mine and the Hayden Facility, to the Gila River from the Ashurst-Hayden Diversion Dam, upstream past the confluence of the San Pedro and Gila Rivers, and for a distance of 5 miles up each of those rivers beyond the confluence and to Mineral Creek from its confluence with the Gila River upstream to a point one mile above the Big Box Canyon Dam." The most substantial injuries occurred in the reach of Mineral Creek that extends from the tunnel outlet to the Gila River. The report finds that, "Dissolved copper concentrations in the surface water of this reach have been recorded up to 130 times surface water quality standards that will sustain aquatic life, and sediment copper concentrations have been recorded to exceed up to 22 times the level beyond which injury is inflicted on sediment-dwelling organisms (MacDonald et al. 2000)." These concentrations of copper caused a complete loss of aquatic life in this reach.[98] Overall, the report found that, "ecosystem services lost in the 117 acres that include Mineral Creek and its associated riparian habitat were estimated to be 100% from 1981-

	2005, and up to 50% from 2005 to the present (Lipton 2009). Hazardous releases also affected the aquatic and riparian portions of the Gila River near the Ray Mine/Hayden Smelter Complex, including approximately 2,930 acres upstream of Mineral Creek to the confluence with the San Pedro River, and approximately 1,620 acres downstream of Mineral Creek to the Ashurst-Hayden Dam. The most substantial loss of ecosystem services in these areas occurred during the three years following the release of 300,000 tons of tailings in 1993, when ecosystem service losses were estimated at 10-25% (Lipton 2009)."[99]

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

CHINO MINE, NM (Freeport McMoRan) The Chino Mine is located approximately 12 miles southeast of Silver City, New Mexico. The site is east of the Continental divide and drains into ephemeral drainages in the Mimbres watershed.	
Reports of pipeline failures and other accidental releases*	2007: A spill involving one million gallons of acidic mine waters overflowed a containment sump into a storm water diversion channel and traveled more than two and a half miles down a surface water tributary near the mine. The spill resulted in groundwater contamination and a settlement of $276,000 was reached with the State of New Mexico.[100] Multiple other tailings spills have occurred, which are listed below:[101] 2000: Report of 480,000 gallons of tailings slurry discharged, with 93,000 gallons entering Whitewater creek. 1999: Report of 3.25 million gallons of tailings spilled into Whitewater Creek. 1997: Report of 100,000 gallons of tailings spilled into Whitewater Creek. 1996: Report of 152,000 gallons of liquid tailings spilled into Whitewater Creek. 1993: Report of 208 tons and 91,500 gallons of tailings accidentally released to Whitewater Creek in six separate incidents resulting from the rupture of degraded pipes. 1992: Report of 120,000 gallons of tailings spilled into a basin. 1991: Report of 3,200 gallons of tailings released into Whitewater Creek when a tailings pipeline ruptured. 1988: Heavy rains led to the release of 180 million gallons of acidic wastewater into Whitewater Creek over a 35-day period. Analysis of the wastewater indicated that it had 30 times the allowed levels of the hazardous substance cadmium, as well as more than 30 times the allowed levels of sulfates.[102] Enlargement of the precipitation plant reservoir was completed in 1985 to prevent overflows of leachate solution into Whitewater Creek. Above average precipitation however caused the new reservoir to overflow and discharge waters to Whitewater Creek on October 9 and 10, 1985; May 6, 1986 and October 6, 1986.[103]
Water collection and treatment failures	In 2011, the U.S. Department of Justice and State of New Mexico issued a consent decree for damages to natural resources from hazardous substances from the Chino, Tyrone and Cobre mines.[104] The settlement followed an investigation of natural resource injuries related to the release of hazardous substances into the environment from acid mine drainage and process solution, among other sources. It found that, "surface water and associated sediments are exposed to hazardous substances released from the Chino Mine through a variety of pathways, including leaks and spills of process water, tailings spills; runoff, and infiltration or percolation from tailings and waste stockpiles."[105] Groundwater contamination from tailings pond #7, which became active in 1988, has occurred to the east, west and south of impoundment. It also found that hazardous substances have been released into groundwater at the Chino mine from multiple source areas.[106] Concentrations of hazardous substances in groundwater in exceedance of water quality standards confirm release to groundwater throughout the Chino Mine. Groundwater flow modeling for the North Mine area indicates that contaminated groundwater in four of these areas is not captured by dewatering in the main pit. In the South Mine area, groundwater has exceeded standards for manganese and cadmium at Middle Whitewater Creek, Hurley and Lake One, and has exceeded standards for copper at Lake One.[107]

	A 2012 assessment of groundwater impacts concluded that contaminated seepage from the mine will require water treatment in perpetuity.[108]
Tailings spills and impoundment failures	Tailings spills (see above).
Impacts to water, fish and wildlife	The 2003 ecological risk assessment reported elevated concentrations of the hazardous substances copper and zinc in surface water from five different drainages at the Chino Mine, including Hanover/Whitewater Creek, Bayard Canyon, Bolton Draw, the unnamed drainage between Bolton Draw and Lampbright Draw and Lambright Draw.[109] The areal extent of injured alluvial and regional groundwater at the Chino Mine is 13,935 acres.[110] According to the closure plan for the Chino Mine, contaminated groundwater will require water treatment in perpetuity.[111]

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

BAGDAD MINE, AZ (Freeport McMoRan) The Bagdad Mine is an open pit copper and molybdenum complex 100 miles northwest of Phoenix, Arizona.	
Reports of pipeline failures and other accidental releases*	2009: Report of a broken pipeline causing a release of 2,378,500 gallons of sulfuric acid.[112] 2007: Report of 22,500 gallons of raffinate solution containing sulfuric acid spilled from a pond.[113] 2004: Report of 7,484 pounds of sulfuric acid released due to malfunction of pipe.[114] 2004: Report of 354 pounds of sulfuric acid released due to crack in pipe.[115] 1999: Report of 12,000 gallons of process water with residual chlorine spilled into Bridle Creek.[116] 1997: Report of 1,500 pounds of sulfuric acid due to pipeline failure.[117] 1997: Report of 7,200 pounds of sulfuric acid overflowed from pond due to drain blockage.[118]
Water collection and treatment failures	In 1996, the EPA and the state of Arizona announced that Cyprus Bagdad Copper Corp., a subsidiary of Cyprus Mineral Corp., paid penalties totaling $760,000 for discharging contaminated water from the Bagdad Copper Mine.[119] The discharges involved various facilities including tailings ponds, leach dumps, and a sewage treatment plant, but by far the major discharges came from the Copper Creek Leaching Basin, in which acidic, copper-tainted underground seepage entered Boulder Creek.[120] According to an EPA report, seepage of pregnant leach solution from the Copper Creek Leaching System was discovered in a receiving pool in Boulder Creek in 1991.[121] Studies indicated that instead of being contained by the Copper Creek Flood Basin, the heavily contaminated solution seeped under the dam. The concentration of total copper in samples collected in the pool in Boulder Creek were as high as 76.4 mg/l. On March 29, 1993, U.S. EPA issued a Finding of Violation and Order against Cyprus.[122] According to a 2006 study that compared the water quality predictions made during mine permitting with water quality impacts during operations, although no water quality impacts were predicted during the permitting process, the following water quality violations occurred: Water quality monitoring (1998-2002) in Boulder Creek, found water quality exceedances for arsenic, lead, mercury, and selenium. In Burro Creek, there were water quality exceedances for copper and mercury. In Butte Creek, there were water quality exceedances for mercury and selenium[123]
Tailings impoundment spills and/or failures	
Impacts to water, fish and wildlife	Copper and low pH releases to ground and surface waters, hazards to aquatic life from solution releases beneath and over containment system dam. Water quality impacts to Boulder Creek, Burro Creek and Butte Creek.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

SIERRITA MINE, AZ (Freeport McMoRan) The Sierrita Mine is an open pit copper and molybdenum mining complex 20 miles southwest of Tucson, Arizona.	
Reports of pipeline failures and other accidental releases*	2011: Report of 849 gallons of sulfuric acid spills from a pipeline leak.[124] 2008: Report of 1,100 gallons of sodium hypochlorite spilled due to loose pipe.[125] 2005: Report of 1,000 pounds of sulfuric acid from a broken pipeline.[126] 2005: Report of 8,058 pounds of sulfuric acid released from a broken pipeline.[127] 2002: Report of 39,375 pounds of sulfuric acid spilled from a pipeline due to a separated flange.[128] 2001: Report of 1,209 pounds of sulfuric acid spilled from pipeline.[129] 2000: Report of 5,350 gallons of leach solution spilled from pipe.[130] 1998: Report of 160,000 gallons of mill tailings spilled into water due to overflow resulting from power failure.[131] 1998: Report of 40,000 gallons leach solution spilled from pipeline.[132] 1998: Report of 120,000 gallons of leach solution spilled from pipeline.[133] 1997: Report of 2,798 pounds of sulfuric acid spilled due to pipeline rupture.[134] 1997: Report of release of 8,000 pounds of sulfuric acid due to pipe joint failure.[135] 1996: Report of release of 3,000 gallons of sulfuric acid due to pipeline failure.[136] 1994: Report of another pipeline break allowed a discharge into Demetrie Wash of approximately 120,000 gallons of reclaim water.[137] 1994: Report of approximately 5,000 gallons of reclaim water were released as a result of a pipeline break.[138] 1993: Report of a leak in a pipeline transporting process water discharged approximately 200,000 gallons of a mixture of process wastewater and storm water run-off to an unnamed tributary of Demetrie Wash.[139] 1993: Report of Cyprus Sierrita discharging approximately 2,700,000 gallons into the same wash as a result of another pipeline break.[140] 1993: Report of approximately 450,000 gallons released to the wash in October 1993 by a broken pipeline.[141]
Water collection and treatment failures	From the summer of 1992 until December 1994, Sierrita discharged contaminated process water and storm water run-off to Demetrie Wash and its tributaries from various overflows, seepages, and pipeline leaks and breaks.[142] In 1996, the U.S. Department of Justice issued a civil claim against Cyprus Sierrita on behalf of the State of Arizona and the U.S. pursuant to the Clean Water Act.[143] Cyprus Sierrita entered into a Consent Decree to pay a penalty of $88,000 for numerous violations. According to a 2011 report, seepage from an unlined tailings pond at the Sierrita mine has sent a plume of contaminated groundwater toward the city of Green Valley, causing drinking water wells to record high levels of sulfates.[144] In 2006, the company signed a mitigation order on consent with the State of Arizona to address sulfate in drinking water. It requires the company to develop a mitigation plan to be submitted in 2009.
Impacts to	Ground water and surface water contamination have occurred from pipeline leaks and breaks, overflows, and underground seepage from process wastewater, wastewater, and

water, fish and wildlife	storm water surface impoundments. Drinking water wells have been affected.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

PINTO VALLEY MINE, AZ (BHP Billiton) The Pinto Valley Mine is an open pit copper and gold mine located about 126 km east of Phoenix, AZ. Formerly owned by Magma Copper Company.	
Reports of pipeline failures and other accidental releases	2010: Report of a storm event, which caused 5,362 tons of tailings to spill onto soil and Pinto Creek, including 214 pounds of arsenic and 11 pounds of lead.[145] 500 cubic yards were released into water. Pinto Creek is a tributary to Roosevelt Lake. 2010: Report of an unknown amount of mine tailings released onto land, with a potential release to water, due to heavy rains.[146] 2007: A release of impounded storm and seepage water occurred due to a flange separation in a tailings line. The unexpected release washed out a section of the secondary containment, which allowed it to escape. An estimated 45,000 gallons of water (stormwater and tailings seepage) reported to an unnamed tributary to Pinto Creek.[147] 2001: Report of 1,725 pounds of sulfuric acid released due to pipeline break.[148]
Water collection and treatment failures	According to a 2001 EPA report, a portion of Pinto Creek from its headwaters to Spring Creek was first listed as water quality limited in 1992 based on elevated copper concentrations and pH values that were related to discharges from the Pinto Valley and another mine. The remaining portions of the stream were added to the 303(d) list in 1994.[149] The report further states that, "Since 1989, extreme storm events caused releases of copper bearing sediments and liquids to Pinto Creek from Pinto Valley operations. These releases resulted from partial tailings dam failures, pipeline breaks, seepage flows, conveyance blockages, and storm water overflows. Recent significant release events occurred in August 1989, July 1990, January 1991, August to September 1991, January to February 1993, and October 1997. In each of these events, materials were released in quantities sufficient to impact Pinto Creek or its tributaries."[150] Based on EPA's review of discharge monitoring reports between January 1990 and September 1991, Magma (now Pinto Valley) reportedly discharged effluent to Pinto Creek or its tributaries in excess of allowable effluent limitations on numerous occasions, and/or did not collect and analyze samples, in violation of permit conditions.[151] According to the report, during the first episode, approximately 3,000 gallons of effluent containing total suspended solids and copper of unknown concentrations was discharged from the ditch. A similar discharge of 24,000 gallons occurred on September 5, 1991. An estimated 39,000 gallons of effluent in exceedance of Arizona Surface Water Quality Standards and Aquifer Water Quality Standards for copper, zinc, and lead were discharged from the ditch on September 23, 1991.[152]
Tailings spills or failures	In 1997, a partial tailings failure deposited an estimated 276,000 cubic yards of tailings in Pinto Creek.[153] It buried 8.1 acres of creek bed and surrounding upland with material as deep as 42 feet.[154] Another incident occurred in 1993, when heavy rainfall overwhelmed the mine's water management capabilities. During the rainfall event, a reservoir overflowed the tailings pile, tore out a levee, and carried tailings to Pinto Creek.[155] In addition, a retention pond that held storm water and mineral wastes discharged material into the creek after its dam was breached. According to an EPA report of the incident, "Critical water containment structures in place at the mine in 1992 were reportedly designed to hold a 100-year, 24-hour storm event. Nonetheless, the mine discharged hundreds of tons of tailings and millions of gallons of contaminated water into Pinto Creek."[156] Water quality sampling during January and February 1993 indicated 286 exceedances of daily and monthly water quality parameters. Fish surveys collected before and after the discharges showed a

	marked decline in populations of the desert sucker (*Pantosteus clarki*) following the discharges. Although they were abundant in 1992, a summer survey in 1993 found only one adult in Pinto Creek.[157] In January 1991, the face of Tailings Dam No. 3 failed, releasing 150 - 250 tons of tailings into Pinto Creek, and two million gallons of water.[158] In March 1991, another large quantity of tailings was released from the same pile.[159] This release occurred from an over-saturation of the tailings face benches due to heavy precipitation, and an estimated 3.4 million gallons of water also were discharged.
Impacts to water, fish and wildlife	Extensive impacts to surface water quality and fish habitat in Pinto Creek resulting from tailings spills, and other mine related impacts.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

MISSION COMPLEX MINE, AZ (ASARCO) The Mission Mine complex is an open pit copper mine and underground copper mine located near Sahuarita, Arizona (18 miles south of Tucson). The Mine covers approximately 29.7 square miles, and a portion of the mine occupies tribal lands.	
Reports of pipeline failures and other accidental releases*	2011: Report of a backup of a tailing line resulting in release of tailings into a dry wash.[160] 2002: A violation involving the discharge of primarily copper laden stormwater runoff and process water discharge to ephemeral tributaries of the Santa Cruz river near Tucson in violation of the facilities Multi Sector General Permit Case # 09-2002-0064. 2001: Report of a 36-inch distribution tailings line releasing 200 tons of tailings into a dry stream channel.[161]
Water collection and treatment failures	According to EPA fact sheet released in 2008, discharges from mine (outfall 001A) contain significant levels of copper and lead, and TSS, which have been out of compliance since October, 2003.[162] Outfalls from the Mission complex discharge to ephemeral streams that are tributaries to the Santa Cruz River. Three large tailings ponds and several mine dumps are located on land leased from the Indian landowners approximately 1 mile south of the Arroyos project area. According to a report by the Bureau of Reclamation, leachate from these tailings has contributed to elevated levels of sulfate, TDS, and hardness in the aquifer below and adjacent to the ponds.[163]
Tailings spills or impoundment failures	The Bureau of Reclamation Report also states that, "Surface drainage from a break in a tailings pond dike in 1990 released large volumes of material into wash complexes that drain toward the SCR."[164]
Impacts to water, fish and wildlife	Ground and surface water pollution.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

ROBINSON MINE, NV (Robinson Nevada Mining Co.) Formerly owned by BHP Copper, Magma Nevada Mining Company The Robinson Mine is an open pit copper and gold mine located in eastern Nevada approximately 11 km west of Ely, Nevada.	
Reports of pipeline failures and other accidental releases*	1996: The mine experienced eight reported spills during 1996. Most of these spills involved tailings solution and reclaim water releases due to equipment failures. The five spills resulting in releases of copper flotation tailings had spill volumes ranging from 1,500 gallons to 66,000 gallons. Four of these spills resulted in contamination of relatively small areas of soil. The largest spill resulted in contamination of a downstream drainage bed for 2.3 miles with an average flow path width of 3 ft. Two spills resulted in a combined release of 76,000 gallons of reclaim water.[165]
Water collection and treatment failure	In 2010, the State of Nevada issued a Finding of Alleged Violation and Order for the failure to comply with permit and regulatory requirements regarding stabilization of spent ore and associated acid rock drainage at the Intera and Green Springs area.[166] The Order requires the mine to "submit a plan by May 11, 2010 stating whether the Mill-Water Ponds, the overhead standpipe near the Mille-Water Ponds, and any other leaking pipes or tanks in the area, will remain on the Liberty Dump or be moved off the Liberty Dump (and any other potential sources). If the Mill-Water Ponds will remain on the Liberty Dump, specify whether they will be replaced, or tested and repaired to demonstrate integrity of primary and secondary liners. If the ponds will be tested and repaired to demonstrate integrity, include a complete description of the proposed methods to be used for NDEP review and approval."
Tailings spills and impoundment failures	Tailings spill (see above)
Impacts to water, fish and wildlife	Contamination of downstream drainage bed for 2.3 miles from mine tailings process water. (See above)

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

TYRONE MINE, NM (Freeport McMoRan) The Tyrone Mine is located approximately 10 miles southwest of Silver City, New Mexico. The mine straddles the Continental Divide.	
Reports of pipeline failures and other accidental releases*	2006: Report of a spill occurring when a CTI tanker truck loaded with about 3,000 gallons of acid collided with a pickup truck, spilling about 500 gallons of the acid on the highway and adjacent property.[167] (non pipeline) 2003: Report of approximately 2,600 gallons of 16% sulfuric acid solution spilled at the Tyrone mine during maintenance activity on a pipeline system.[168] 2001: Report of 500-1000 gallons of solution leaked from the pipeline.[169] 2001: Report of 300 gallon spill of raffinate and organic solution from pipeline. 2001: Report of 150 gallon spill from the Seep 5# pond, which overflowed with 75 gallons entering Deadman Canyon. Seepage had a pH of 4 and Deadman Canyon was flowing at approximately 50 gpm at the time.[170] 1997: Report of 65,000 gallons of raffinate leaked from a ruptured weld in a raffinate pipeline.[171] 1997: Report of a transfer line rupture due to cold weather. 1994: Report of No. 2 diesel fuel oil from two broken pipes detected in groundwater.[172] 2012 report identifies diesel fuel contaminant concentrations in groundwater from a leak in distribution pipeline at diesel tank farm, which migrated to regional aquifer.[173]
Water collection and treatment failures	In 2011, the U.S. Department of Justice and State of New Mexico issued a consent decree for damages to natural resources from hazardous substances from the Tyrone, Chino, and Cobre mines.[174] The settlement followed an investigation of natural resource injuries related to the release of hazardous substances into the environment from acid mine drainage and process solution, among other sources.[175] According to the investigation, "groundwater in both the regional aquifer and the perched groundwater aquifers at the site have been exposed to hazardous substances through a variety of pathways."[176] The assessment at the Tyrone Mine identified 14 different mine area sources that have affected water quality, including seepage from tailings impoundments, leach stockpiles and waste rock stockpiles. A 2012 groundwater assessment concluded that contaminated seepage from the mine will require water treatment in perpetuity. [177]
Tailings spills and impoundment failures	There have been multiple spills of tailings, releasing hazardous substances. The largest event occurred at the No. 3 tailings dam in 1980, spilling 2.6 million cubic yards of tailings into the Mangas Valley.[178] Tailings flowed 8 kilometers downstream and inundated farmland.[179] The failure occurred due to a dam wall breach. 2001: 5 tons of tailings spilled into the Mangas Wash from the stormwater containment dike at the tailings dam.[180] 1990: Minor tailings spills from the No. 1 tailings pond in January 1990, and similar minor spills from the No. 2 tailings pond during 1990.[181]
Impacts to water, fish and wildlife	Streams and washes in the vicinity of the Tyrone Mine facility are ephemeral – they flow only after significant precipitation events. According to the 2003 preliminary assessment, "Surface water is exposed to hazardous substances released from the Tyrone Mine through a variety of pathways. Mangas Creek,

	an ephemeral stream adjacent to the Mine, which becomes perennial at Mangas Springs has been exposed to hazardous substances through spills and potentially through runoff and erosion."[182] The areal extent of the contaminated groundwater plume at the Tyrone Mine is 6,280 acres.[183] Groundwater seepage will require water treatment in perpetuity (see above).

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

MIAMI MINE, AZ (Freeport McMoRan; formerly owned by Phelps Dodge and Cyprus Amax Minerals) The Miami Mine is an open pit mine located 90 miles east of Phoenix, Arizona.	
Reports of pipeline failures and other accidental releases*	2011: Report of 1,600 pounds of sulfuric acid spilled from pipeline due to faulty weld.[184] 2009: Report of 1,000 pounds of sulfuric acid spilled due to pipeline break.[185] 2007: Report of a release of 9,450 pounds of sulfuric acid from pipeline.[186] 2001: Report of a release of 153 pounds and 6.4 pounds respectively of lead/arsenic from pipeline.[187] 2001: Report of a release of 2,070 pounds of acid plant blowdown from pipeline.[188] 1997: Report of 10,000 gallons of copper sulfate due to overflow of tank.[189] 1996: Report of 50,000 gallons of sulfuric acid due to tank failure.[190] 1996: Report of 8,995 pounds of sulfuric acid due to leaky pipe.[191]
Water collection and treatment failures	The Pinal Creek drainage was designated a Water Quality Assurance Revolving Fund (WQARF) site by the Arizona Department of Environmental Quality in 1989 due to acidity and metals contamination in the alluvial aquifer. The WQARF program is the state equivalent of the Federal "superfund" program. The Miami Mine, inherited from the Cyprus Miami Mine (formerly the Inspiration Mine) is a member of the Pinal Creek Water Quality Assurance Revolving Fund (WQARF) Site.[192] The Pinal Creek site was listed under the Arizona Water Quality Assurance Revolving Fund program in 1989 for contamination in the shallow alluvial aquifers within the Pinal Creek drainage near Miami, Arizona.[193]
Impacts to water, fish and wildlife	The Water Quality Assurance Revolving Fund (WQARF) program is the state equivalent of the Federal "superfund" program. The Miami Mine, inherited from the Cyprus Miami Mine (formerly the Inspiration Mine) is a member of the Pinal Creek Water Quality Assurance Revolving Fund (WQARF) Site.[194] The Pinal Creek drainage was designated a WQARF site by ADEQ in 1989 due to acidity and metals contamination in the alluvial aquifer.[195]

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

SILVER BELL MINE, AZ (ASARCO) The Silver Bell Mine is an open pit copper mine located on the southern edge of the Silver Bell Mountains.	
Reports of pipeline failures and other accidental releases*	2010: Report of 3,983 pounds of sulfuric acid released due to pipeline failure.[196] 2006: Report of 90,000 gallon release of raffinate; a mixture of 5.5 grams per liter of sulfuric acid and various metals. The release was due to equipment failure of a 24-inch mining pipeline.[197] 2002: Report of 242,000 pounds of process solution (with 1300 pounds of sulfuric acid) spilled due to power failure and overflow of solution pond.[198]
Water collection and treatment failures	In 2009, Silver Bell was fined $170,000 for three spills totaling 340,000 gallons of wastewater containing sulfuric acid and heavy metals into dry washes.[199] The pollutants seeped into soil, which endangered the groundwater in the aquifer below the mine and exceeded water quality standards. Two of the spills are described as such: Between Nov. 6 and Dec. 11, 2006, 150,000 gallons of leach solution containing sulfuric acid and metals escaped from a leaking impoundment. And between Nov. 11 and Dec. 13, 2006 another 100,000 gallons of stormwater containing sulfuric acid and heavy metals escaped from a storage pit. According to an EPA report, during site inspections of the mine in January and March 1993, the Arizona Department of Environmental Quality (ADEQ) observed water flowing in three unnamed washes below Silver Bell Mine.[200] Samples taken from the two streams flowing under the waste rock dump showed violations of standards for total selenium, with one stream also violating standards for dissolved copper. The third stream, which flows from the leach dump, showed a broader range of exceedances, and concentrations of copper in this stream were several orders of magnitude greater than the concentrations in the other streams. Analyses showed violations of standards for pH, total zinc, total cadmium, and dissolved copper.
Tailings spills and impoundment failures	Tailings spills (See below).
Impacts to water, fish and wildlife	According to a 2000 report on native fish populations by Pima County, "The loss of native fish along Cocio Wash is a good example of the potentially damaging effects that mining can have on aquatic ecosystems. Summer floods in July and August 1981 swept gray clay sediments from a Silverbell Mine tailings pond into the wash. BLM biologist Bill Kepner later reported, Our studies indicate that the Cocio Wash topminnow population is now extinct in that habitat due to recurrent mine spills and inundations by mine tailings... (Fonseca, 2000)."[201]

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

MINERAL PARK MINE, AZ (Mercator) Mineral Park is an open pit copper mine in the Cerbat Mountains near Kingman, AZ.	
Reports of pipeline spills and other accidental releases*	1996: Report of 150 - 200 gallons of sulfuric acid released from acid storage tank due to equipment failure.[202] 1996: Report of 200 gallons of sulfuric acid released.[203] 1996: Report of 1,100 gallons of sulfuric acid spilled.[204]
Water collection and treatment failures	According to a 1995 report by the Arizona Geological Survey, water quality samples were taken of streamflow just below the Mineral Park mine and of mine water seeping through a dam at the southwest end of the tailings.[205] Both samples showed extremely low pH values (3.2, 2.6), extremely high TDS values (5,549 and 6,625 mg/L) and extremely high sulfate contents (4,500 and 6,000 mg/L). According to the report, "the cadmium concentration of the stream flow just downstream of the Cyprus Mineral Park Mine place is 75.4 times higher than the standard, copper exceeds the standard 51 times and zinc 17.2 times." It further states that, "The discharge from the tailings ran down the washes until about two years ago, when the dam around the tailings was built. In years with very heavy rains the water could eventually reach the Sacramento Wash."[206] According to a 1999 EPA report, the Mineral Park Mine collected surface water samples from seven drainages and analyzed them for metals and radio-chemicals.[207] All of these drainages, except for Golden Eagle Spring, exceeded either the federal Maximum Contaminant Levels (MCLs) and or state guidelines for gross alpha or gross beta. According to the report, "ADEQ observed that surface water runoff emanating from the drainages in the mine area were affecting the water quality of the alluvial pediment." Data showed that the plume contained high levels of beryllium, cadmium, fluoride and nickel. The report further stated that, "the data show that TENORM is discharging from abandoned mine adits and is impacting surface water and that mining operations have impacted groundwater."[208] A 2006 technical feasibility report commissioned by the company also describes a plume of contaminated groundwater migrating down-gradient from the mine.[209]
Impacts to water, fish and wildlife	See above.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

CONTINENTAL PIT MINE, MT (Montana Resources) The Continental Pit is immediately adjacent to the Berkeley Pit in Butte Montana, and was initially known as the East Berkeley Pit. The Berkeley Pit and Continental Pit are included within the boundaries of the Silver Bow Creek/Butte Area Superfund site, which was established in 1983. Mining in the Berkeley Pit was discontinued in 1982, and in the East Berkeley Pit (now the Continental pit) in 1983. Mining was resumed in the Continental Pit by Montana Resources in 1986.[210] Because of their proximity, management of water and mine waste at the two mine sites are closely intertwined.	
Reports of pipeline spills and other accidental releases*	On January 28, 2009, an incident was reported to the Department involving a broken tailings line while crews were doing maintenance. The cause was attributed to a tailings line that was plugged with ice and a weld broke. The water was shut off within five minutes and no water left the site or reached state waters.[211] 1992: Department records show an accidental release of 0.34 million gallons in August of 1992.[212]
Water collection and treatment failures	According to a 1993 report, the sources of groundwater contamination in the Butte Mine Flooding Operable Unit of the Superfund Site were identified as: the underground workings; the walls of the Berkeley and Continental Pits; mine water in the underground workings; waste rock and tailings piles near the Berkeley Pit; leaking solutions from the leach pad and the Weed/MR Concentrator areas; leaking solutions from the Yankee Doodle Tailings Pond; contaminated soils and alluvium, and sulfuric acid added to the underground mines for copper leaching. Sources of water containing hazardous substances include: 1) process solutions from the historic Weed Concentrator and the current MR Concentrator.[213] Montana Resources suspended mining in the Continental Pit from 2000-2003 due to rising electricity costs.[214] During that time, about 7.5 billion gallons of water, or an average of 6 million gallons per day, went into the Berkeley Pit, to be combined with the highly acidic pit water already there. Montana Resources also diverted water from the Continental Pit into the Berkeley Pit for containment during their suspension. This contributed to increased water levels in the Berkeley Pit, and triggered the need to develop a water treatment plant to treat the contaminated water from the pit, which was rising to a critical level where contaminated pit water becomes an additional source of contamination to the surrounding aquifer and Silver Bow Creek. Under a consent decree with the State of Montana and US Department of Justice, a treatment plant was constructed and the mining companies are obligated to continue water treatment in perpetuity to prevent additional groundwater contamination.[215] Mine tailings from the Continental Pit mine are placed in the Yankee Doodle tailings impoundment, which also contains the mine waste from previous mining at the Berkeley Pit. The tailings impoundment is unlined, and seepage from the impoundment travels through faults and fractures into the Berkeley Pit. When mining ceases, seepage from the tailings impoundment will continue to contribute contaminated water to the Berkeley pit. As noted above, a consent decree requires contaminated water from the Berkeley Pit to be collected and treated in perpetuity.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

REFERENCES

[1] Wanty, R.B., et al. "Environmental Behavior of several porphyry molybdenum and copper deposits in the western U.S.," Presented at the 4th European Congress on Geoscientific Cartography, Bologna, Italy, June 16-20, 2003., available at *crustal.usgs.gov/projects/near_surface_processes/.../porphyry.pdf*

[2] Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.*

[3] US Geological Survey, 2010 Minerals Yearbook, Copper (Advanced Release), June 2012.

[4] Freeport McMoran, 2011 Securities and Exchange Commission, Form 10-K.

[5] Ibid.

[6] Ibid.

[7] Ibid.

[8] Ibid.

[9] US Geological Survey, 2010 Minerals Yearbook, Copper (advanced Release), June 2012.

[10] Freeport McMoran, 2011 Securities and Exchange Commission, Form 10-K.

[11] http://azgeology.azgs.az.gov/article/minerals-and-mining/2011/09/2010-arizona-mining-review

[12] Ibid.

[13] Ibid.

[14] Ibid.

[15] US Geological Survey, 2010 Minerals Yearbook, Copper, June 2012.

[16] Arizona Dept. Of Environmental Quality, Press Release, "Freeport McMoran Morenci Inc. Agrees to $150,000 Settlement to Resolve Water Quality Violations from 2008 Spill," July 14, 2011

[17] National Response Center, Incident No. 835711

[18] National Response Center, Incident No. 802300

[19] ADEQ, Hazardous Materials Incident Logbook, Incident No. 99-005-B, http://www.azdeq.gov/databases/hwssearch.html

[20] National Response Center, Incident No. 791470

[21] National Response Center, Incident No. 739154

[22] ADEQ, Hazardous Materials Incidence Logbook, Incident No. 01-081-E

[23] ADEQ, Hazardous Materials Incidence Logbook, Incident No. 01-022-D

[24] ADEQ, Hazardous Materials Incidence Logbook, Incident No. 99-005-B

[25] National Response Center, Incident No. 356439

[26] National Response Center, Incident No. 318896

[27] National Response Center, Incident No. 341565

[28] ADEQ, Hazardous Materials Incidence Logbook, Incident No. 96-052-C

[29] ADEQ, Hazardous Materials Incidence Logbook, Incident No. 95-028-C

[30] National Response Center, Incident No. 240459

[31] National Response Center, Incident No. 259755

[32] Nationa Response Center, Incident No. 205224

[33] National Response Center, Incident No. 198794

[34] National Response Center, Incident No. 134354

[35] National Response Center, Incident No. 134921

[36] National Response Center Incident No. 113212

[37] United States and State of Arizona v. Freeport McMoran Corporation and Freeport McMoran Morenci Inc, Consent Decree, Case 4:12-cv-00307-HCE, April 2012.

[38] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. 3-4.

[39] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. S-7.

[40] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. 3-7.

[41] US Department of Justice, Press Release: "Freeport-McMoran Corp and Freeport-McMoran Morenci Inc. will pay $6.8 million in Damages for Injuries to Natural Resources from the Morenci Copper Mine in Arizona. April 24, 2012. http://www.justice.gov/opa/pr/2012/April/12-enrd-527.html

[42] National Response Center, Incident Report No. 987867

[43] National Response Center, Incident Report No. 990280

[44] National Response Center, Incident Report No. 985090

[45] National Response Center, Incident Report No. 929521

[46] National Response Center, Incident Report No. 853889

[47] National Response Center, Incident Report No. 823579

[48] National Response Center, Incident Report No. 820928

[49] National Response Center, Incident Report No. 812340

[50] National Response Center, Incident Report No. 792304

[51] National Response Center, Incident Report No. 738803

[52] National Response Center, Incident Report No. 711893

[53] National Response Center, Incident Report No. 706853
[54] National Response Center, Incident Report No. 653465
[55] National Response Center, Incident Report No. 646582
[56] National Response Center, Incident Report No. 646700
[57] National Response Center, Incident Report No. 646508
[58] National Response Center, Incident Report No. 604649
[59] National Response Center, Incident Report No. 561032
[60] National Response Center, Incident Report No. 530556
[61] National Response Center, Incident Report No. 537295
[62] US EPA, Kennecott North, ROD, 2002. p. 129 of pdf.
[63] Ibid.
[64] US EPA, Kennecott North ROD, 2002, p. 205 of pdf.
[65] US EPA, ECHO.gov, Kennecott copper smelter & refinery, CWA/NPDES compliance status, Apr-June 2011 & Jul-Sept. 2011.
[66] http://www.epa.gov/region8/superfund/ut/kennecottsouth/index.html
[67] US EPA, Kennecott North ROD, September 2002.
[68] Richard Borden, et. al. "Groundwater response to the end of forty years of copper heap leach operations, Bingham Canyon Utah." Paper presented at the 7th International Conference on Acid Rock Drainage, March 26-30, 2006. Published by the American Society of Mining and Reclamation, 3134 Montavesta Road, Lexington, KY 40502. p. 231.
[69] United States v. Kennecott Utah Copper Corporation. Complaint Case: 2:08cv00122. February 14, 2008. *www.**fws**.gov/.../r_r_Kennecott_Utah_Copper_ComplaintFinal.pdf*
[70] Ibid.
[71] Ibid.
[72] National Response Center, Incident Report No. 1013648
[73] ASARCO Press Release, "ASARCO Settles with ADEQ Over Tailings Spill," April 2010.
[74] Arizona Department of Environmental Quality, Notice of Violation for Case No. 79745, July 12, 2007.
[75] National Response Center, Incident Report No.826624
[76] National Response Center, Incident Report No. 808478
[77] ADEQ Hazardous Incident Report Database, Incident No. 01-037-E
[78] ADEQ, Hazardous Incident Report Database, Incident No. 01-088-D
[79] ADEQ, Hazardous Incident Report Database, Incident No. 99-150-D
[80] State of Arizona and US Department of Interior, "Draft Restoration Plan and Environmental Assessment for the Hazardous Substance Releases from the Hayden Smelter and Ray Mine Facilities, February 2012. p. 3.
[81] Ibid.
[82] Ibid.
[83] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 65.
[84] Ibid.
[85] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 63
[86] Ibid.
[87] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 54
[88] Ibid.
[89] Ibid.
[90] Personal Communication, Peter Jagow, Compliance inspector, Arizona DEQ, July 10, 2012, based on February 2012 inspection.
[91] Arizona Department of Environmental Quality, Notice of Violation, Case ID #130170, May 9, 2012.
[92] National Response Center, Incident No. 975013
[93] Arizona Department of Environmental Quality, Inspection Report, May 6, 2011.
[94] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 59.
[95] Ibid.
[96] Ibid.
[97] State of Arizona and US Department of Interior, "Draft Restoration Plan and Environmental Assessment for the Hazardous Substance Releases from the Hayden Smelter and Ray Mine Facilities," February 2012.
[98] Ibid.
[99] Ibid.
[100] New Mexico Environmental Department, Press Release: Environment Department Reaches $276,000 Settlement with Freeport McMoran Chino Mines Co. Regarding Acid Spill that Contaminated Groundwater in Silver City." April 17, 2009.
[101] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. P. 2-13.
[102] Stratus Consulting, "Preliminary Assessment Screen for the Chino, Tyrone and Morenci Mine Sites, Grant County, New Mexico and Morenci, Arizona," Prepared for US Fish and Wildlife Services, June 2003, p. 3-4.
[103] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. 51 of pdf.
[104] United States and State of New Mexico v. Freeport McMoran Corporations, et. al, Consent Decree, Case 1:11-cv-01140. December 2011.

[105] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. 3-3.
[106] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. 2-16.
[107] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003. p. p. 2-18.
[108] New Mexico Office of Natural Resources Trustee, "Final Groundwater Restoration Plan for the Chino, Cobre and Tyrone Mine Facilities, January 4, 2012. p. 2-14.
[109] Stratus Consulting Inc., "Preassessment screen for the Chino, Tyrone and Cobre Mines Prepared for the US Fish and Wildlife Services, June 18, 2003.
[110] New Mexico Office of Natural Resource Trustees, "Draft Groundwater assessment Restoration Plan for the Chino, Tyrone and Cobre Mines," September 2011. p. 5 of pdf.
[111] New Mexico Office of Natural Resources Trustee, "Final Groundwater Restoration Plan for the Chino, Cobre and Tyrone Mine Facilities, January 4, 2012. p. 2-14.
[112] National Response Center, Incident No. 922634
[113] National Response Center, Incident No. 825857
[114] National Response Center, Incident No. 743528
[115] National Response Center, Incident No. 734733
[116] National Response Center, Incident No. 476104
[117] National Response Center, Incident No. 379507
[118] National Response Center, Incident No. 403949
[119] US EPA, press release, "Cyprus Bagdad to pay $760,000 to settle water pollution charges," 9/16/1996.
[120] Ibid.
[121] US EPA, Damage Cases and Environmental Releases from Mine and Mineral Processing sites, 1997.
[122] Ibid.
[123] Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.*
[124] National Response Center, Incident No. 981624
[125] National Response Center, Incident No. 891124
[126] Arizona Department of Environmental Quality, Hazardous Materials Incidence Logbook, *http://www.azdeq.gov/databases/hwssearch.html*, Incident No. 06-019-J.
[127] ADEQ, Incident No. 06-019-J
[128] ADEQ, Incident No. 02-115-J
[129] ADEQ, Incident No. 02-007-J
[130] ADEQ, Incident No. 00-168-D
[131] National Response Center, Incident No. 444403
[132] ADEQ, Incident No. 98-047-B
[133] ADEQ, Incident No. 98-048-B
[134] National Response Center, Incident No. 394775
[135] National Response Center, Incident No. 382190
[136] National Response Center, Incident No. 327271
[137] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997, p. 173.
[138] Ibid.
[139] Ibid.
[140] Ibid.
[141] Ibid.
[142] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997, p. 173.
[143] Ibid.
[144] Martha Mottley, for Freeport McMoran, "Water Re-use for Managing Impacted Water at Sierrita Mine," Power Point Presentation, May 3, 2011.
[145] National Response Center, Incident No. 929841
[146] National Response Center, Incident No. 929371
[147] BHP Billiton, Follow-Up Report, Environmental Release, National Response Center, Letter to EPA, October 31, 2007.
[148] National Response Center, Incident No. 580872
[149] US EPA, Region 9, Total Maximum Daily Load for Copper into Pinto Creek, Arizona, April 2001. p. 11.
[150] Ibid. p. 14.
[151] US EPA, Damage Cases and Environmental Releases from Mine and Mineral Processing sites, 1997. p. 32.
[152] Ibid.
[153] US EPA, Region 9, Total Maximum Daily Load for Copper into Pinto Creek, Arizona, April 2001. p. 14.
[154] US Fish and Wildlife Service, Environmental Contaminants Program website, Pinto Creek Restoration, News and Activities, Arizona. Posted on December 22, 1999. Available at: http://www.fws.gov/contaminants/DisplayNews.cfm?NewsID=E2D4E088-7448-11D4-A169009027B6B5D3
[155] US EPA, Damage Cases and Environmental Releases from Mine and Mineral Processing sites, 1997. p. 35.

[156] Ibid.
[157] Ibid. p. 36.
[158] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 38.
[159] Ibid.
[160] National Response Center, Incident No. 986438.
[161] National Response Center, Incident No. 565739
[162] US EPA, ASARCO Mission Complex Fact Sheet: EPA PERMIT NO. AZ0024635, September 22, 2008.
[163] US Department of Interior, Bureau of Reclamation, San Xavier District Arroyos Recharge Project, Final Environmental Assessment, May 2009. p. 16.
[164] Ibid.
[165] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997, p. 170. The Robinson Mine was formerly owned by BHP Copper, Magma Nevada Mining Company.
[166] Nevada Department of Environmental Quality, Finding of Alleged Violation and Order, Robinson Operation, White Pine County, Nevada, April 2010.
[167] Associated Press, "Acid Spill Near Tyrone Cleaned Up" Albuquerque Journal, November 10, 2006. Available at: http://www.abqjournal.com/news/state/apspill11-10-06.htm
[168] National Response Center, Incident No. 649767
[169] Ibid.
[170] Stratus Consulting, Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico, and Morenci, Arizona, Prepared for US Fish and Wildlife Service, June 18, 2003. p. 2-15.
[171] Ibid. p. 2-14.
[172] Ibid. p. 2-15.
[173] New Mexico Office of Natural Resources Trustee, "Final Groundwater Restoration Plan for the Chino, Cobre and Tyrone Mine Facilities, January 4, 2012. p. 2-15.
[174] United States and State of New Mexico v. Freeport McMoran Corporations, et. al, Consent Decree, Case 1:11-cv-01140. December 2011.
[175] Stratus Consulting, Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico, and Morenci, Arizona, Prepared for US Fish and Wildlife Service, June 18, 2003.
[176] Stratus Consulting, Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico, and Morenci, Arizona, Prepared for US Fish and Wildlife Service, June 18, 2003.
[177] New Mexico Office of Natural Resources Trustee, "Final Groundwater Restoration Plan for the Chino, Cobre and Tyrone Mine Facilities, January 4, 2012. Table 2.1. p. 2-14.
[178] Stratus Consulting, Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico, and Morenci, Arizona, Prepared for US Fish and Wildlife Service, June 18, 2003. Table 2.3. p. 2-11.
[179] World Information Service on Energy (WISE) Uranium Project, Chronology of Major Tailings Dam Failures, website available at: http://www.wise-uranium.org/mdaf.html
[180] Stratus Consulting, Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico, and Morenci, Arizona, Prepared for US Fish and Wildlife Service, June 18, 2003. p. 2-11.
[181] Ibid.
[182] Ibid. p. 3-6.
[183] New Mexico Office of Natural Resources Trustee, "Final Groundwater Restoration Plan for the Chino, Cobre and Tyrone Mine Facilities, January 4, 2012. p. 3-18.
[184] National Response Center, Incident No. 1001170
[185] National Response Center, Incident No. 916652
[186] National Response Center, Incident No. 849665
[187] Arizona Department of Environmental Quality, Hazardous Materials Incidence Logbook, Incident No. 01-200-B
[188] ADEQ, Incident No. 01-183-B
[189] National Response Center, Incident No. 383245
[190] National Response Center, Incident No. 367631
[191] National Response Center, Incident No. 356429
[192] http://www.g-a-l.info/AttachmentFour.htm
[193] Ibid.
[194] http://www.g-a-l.info/AttachmentFour.htm
[195] Ibid.
[196] National Response Center, Incident No. 942625
[197] ADEQ, Press Release: Silver Bell Mining to Pay $170,000 in civil penalties for water quality violations in Pima County. April 7, 2009.
[198] National Response Center, Incident No. 630005
[199] ADEQ, Press Release: Silver Bell Mining to Pay $170,000 in civil penalties for water quality violations in Pima County. April 7, 2009.
[200] US EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997. p. 23.
[201] Pima County, Arizona Board of Supervisors, Historical Occurrence of Native Fish in Pima County, December 2000. p. 19.
[202] National Response Center, Incident No. 356225
[203] ADEQ, Hazardous Materials Incident Logbook, 96-067-C
[204] ADEQ, Hazardous Materials Incident Logbook, 96-088-C

[205] Arizona Geological Survey, Contributed report 95-I, Water Qualtiy Investigations in the Historic Mining District of Chloride and Adjacent Areas in the Cerbat Mountains (Mojave County, AZ), December 1995. p. 19.
[206] Ibid. p. 20.
[207] US EPA, Technologically Enhanced Naturally Occurring Radioactive Materials in the Southwestern Copper Belt of Arizona, October 1999. p. 55.
[208] Ibid. p. 58.
[209] Range Consulting Group, LLC, "Technical Report Preliminary Feasibility on Phase I and Phase II Copper-Moly Milling Expansion Mineral Park Mine, Mohave County, Arizona. December 2006. p. 17.
[210] Maest, Ann S. and John J. Metesch, Butte Groundwater Injury Assessment Report, Clark Fork River Basin NPL Sites, Montana, Prepared for the State of Montana Natural Resources Damage Program, April 1993.
[211] Montana Department of Environmental Quality, MPDES Permit Fact Sheet, Permit No. MT0000191, May 2012
[212] Ibid.
[213] Maest, Ann S. and John Metesch, Butte Groundwater Injury Assessment Report, Clark Fork River Basin NPL Sites, Prepared for the State of Montana Natural Resources Damage Program, April 1993. p. 2-1.
[214] US EPA, Third Five-Year Review Report for Silver Bow Creek Butte Area, Butte Mine Flooding Operable Unit, June 2011
[215] Ibid.

GREATERYELLOWSTONE.ORG
LOCATIONS IN MONTANA, IDAHO & WYOMING

HEADQUARTERS
215 South Wallace Avenue
Bozeman, Montana 59715
406.586.1593

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

July 24, 2016

Dear Chairman Murkowski and Ranking Member Cantwell:

Please accept the attached Memorandum, **RE: Emigrant Prospect, MT and Lucky Minerals,** dated September 9, 2015, from Center for Science in Public Participation (CSP2)[1] into the official record for the July 26, 2017 Senate Committee on Energy and Natural Resources hearing on the Yellowstone Gateway Protection Act, S.941.

This memo contains critical information regarding mineralogy, geochemistry and the potential for water quality impacts in Emigrant Gulch, one of the two areas proposed for mineral withdrawal under S.941. All of the mineralization (in Emigrant Gulch) appears to be sulfide-based. This presents, "a serious risk for acid drainage and possibly metal leaching, given high pyrite in host rock and mineral zones with apparently low acid-buffering capability."

In a 2016 baseline water quality report of Emigrant Gulch, the Montana Bureau of Mines and Geology indicates, "natural acid rock drainage that may cause the moderately low pH values (pH <3.0) observed in the East Fork of Emigrant Creek. Dilution and buffering result in more neutral pH's observed downstream (pH=7.1)."[2] This report is attached here and please accept as part of the record.

To put it plainly, the natural system currently manages the natural acid drainage adequately to provide clean water downstream. Water that is relied upon for personal, recreational and agricultural uses as well as a tributary to the Yellowstone River and underground aquifers. To upset this balance through massive mining operations exposing minerals and waste rock found in sulfide-based porphyry and breccia hosts will overwhelm the buffering or neutralizing capacity currently found in Emigrant Gulch.

Additionally, CSP2's experienced review of the publicly available information on Lucky Minerals with regards to their business operations indicates that it "seems unlikely, given history and current assets, that they will be able to purchase the claims or complete exploration." In other words, the current mine proponent's ability to invest in adequate monitoring and potential mitigation of water quality risks is a significant concern to the citizens, ranchers and businesses of Paradise Valley.

Respectfully Submitted,

Joe Josephson
Montana Conservation Associate
Greater Yellowstone Coalition

---

[1] CSP2 was organized in 1997 to provide technical assistance to public interest groups on issues related to mining and water quality. The Center has a staff of seasoned professionals with experience from the mining industry, academia, and government. http://www.csp2.org/
[2] LaFave, John, I. 2016. Baseline Water-Quality Investigations, Emigrant Creek Watershed, South-Central Montana, MBMG Ground-Water Open-File Report 23. Montana Bureau of Mines and Geology. Available at: http://mbmg.mtech.edu/pdf/gwof23-emigrantCreek.pdf

CENTER for SCIENCE in PUBLIC PARTICIPATION
PO Box 1250 Chickaloon, AK 99674
Phone (907) 354-3886 / web: www.csp2.org / e-mail: kzamzow@csp2.org
"Technical Support for Grassroots Public Interest Groups"

MEMORANDUM Date: September 9, 2015

From: Kendra Zamzow, Ph.D.

To: Greater Yellowstone Coalition

Re: Emigrant Prospect, MT and Lucky Minerals

CSP2 has reviewed the information available on Lucky Minerals with regards to their business operations, and available information on the Emigrant Mine with regards to mineralogy, geochemistry, and the potential for water quality impacts.

A summary of findings is provided in this memo. References to material can be provided on request, and was all obtained from the Canadian Securities Administrators website SEDAR.

Lucky Minerals

Lucky Minerals, LLC (LJ) is an exploration company that was incorporated in May 2007 and listed on the Toronto Stock Exchange (TSX) in 2009 (Form 2B, June 2009). It had previously been a wholly owned subsidiary of Grand Peak (GP) minerals,[1] and was spun off in December 2008 (MD&A, second quarter 2009) or June 2009 (News release, June 2009). At that time they made a purchase agreement on the Nicos property, mining claims in Quebec (Form 2B, June 2009).

They have had a pattern of picking up purchase options and abandoning them.

Nicos property (claims, Quebec)
Purchased in June 2009, abandoned by March 2011 (MD&A, first quarter 2011)

Hunter property (claims, Guinea, West Africa)
Purchase agreement in March 2010 (News release, October 2010), abandoned December 2010 due to "unsatisfactory review of the geological information and inadequate access to the properties" (News release, December 2010)

Josefina and Silver Mt. properties (claims, Peru)
Purchased for $47,000 in July 2010 and for $25,000 in August 2010 (News releases, June and August 2010), sold together for $131,000 in March 2012 (MD&A, third quarter 2012)

Patricia Parnes property (claims, Ontario)
Purchase agreement March 2011; property was forfeited in December 2013 due to lack of ability to pay up on exploration expenses (MD&A, first quarter 2014; News release July 2014); they made single, annual payments of $25,000 for three years

Vianey gold project (claims and a mine that operated from 1974-1996, Mexico)
Purchase agreement with Grand Peak November 2012, abandoned January 2015 when they could not make their payments (News release, January 2015). They made a single payment

[1] I use LJ, the Toronto Stock Exchange code, as shorthand for Lucky Minerals, and GP as shorthand for Grand Peak.

of $100,000 in May 2013, paid out shares in lieu of cash in June 2014, and made no further payments (MD&A, second quarter 2015).

In July 2014 they began staking claims in the Emigrant area in Montana, made a purchase agreement on seven of the staked claims, and bought 1971-1991 exploration data compiled from drilling data (1970s, 1990s) in 2006 or 2008 by Tetra Tech. A report by Geologic Systems (a company owned by one of the Board) says they have staked 117 claims with lease/option agreements on 17, but this has not been noted in any filings with SEDAR. A July 10, 2014 news release in SEDAR noted that LJ had an agreement to purchase seven staked claims by taking over payments, starting at $10,000 per year and increasing each year for a total of $1 million. They have paid $15,000 to date (MD&A, second quarter 2015).

They offered stock options to raise cash several times (January and February 2013, offered 1 million shares at $0.50/share, June 2014 offered 11 million shares at $0.10/share). Their stock has continually degraded from about $0.58/share in 2013 to $0.07/share since July of this year. Their current cash on hand appears to be about $395,000, with total assets of about $835,000; they appear to be operating at a net loss (Interim financial statement, June 2015). According to the Lucky Minerals March 2015 NI 43-101, exploration costs will be about $2.5 million.

Lucky Minerals has not drilled any holes. Some drilling occurred at most of the sites in 1973, 1976 (Duval Corp.), 1990 (Kennecott), and 1991-1993 (Pegasus), and most of the "technical report" information comes from Tetra Tech's 2006 review of this drilling.

It may be that LJ actually does not control any claims. Lucky notes that they have "purchase/option agreements on 38 unpatented mining claims of 784 acres", and specifies 9 claims on the St. Julian deposit (which require payments for many years). On the final page of the "technical report" is a table of patented claims under option, which appear to be the 9 claims at St. Julien, for a total of about 138 acres. They claim to also have 8 unpatented claims and 117 "unpatented, un-surveyed, staked claims" at about 20 acres each for a total of 2,530 acres; of these 17 are disputed as they may overlap older existing claims. Each of these needs annual payments of $155 for them to keep the claim (over $18,000/year for 117 claims, not including the payments required on the Julian options). All but six were picked up in June, July, or October of 2014.

At this time, they may only have access to the St. Julian property, as they note that they intend to build access roads to other properties while drilling on St. Julian.

Note: It seems unlikely, given LJ's history and current assets, that they will be able to purchase the claims or complete exploration.

At about the same time as the company was trying to raise cash, there were changes within the corporate structure. In February and March 2013 there was a change in CEOs and the appointment of an advisory committee. One of the advisory committee members, Shaun Dykes, moved to the Board of Directors in October 2014 and may be a key player.

He formerly had experience with the Red Chris mine, Tulsequah Chief, Voisey's Bay and others, probably through a company he founded (Geologic Systems, Inc.).

He is also the President/CEO of American CuMo and on the Board of Grenville Gold, which held the Peru claims (http://www.bloomberg.com/profiles/people/7517636-shaun-m-dykes).

His company, Geologic Systems Ltd. conducts exploration at Emigrant and wrote the March 2015 NI 43-101. SEDAR required LJ to change the wording in the report, which suggested research was on "current resources" to clarify the references were historical and must be referred to as "inferred resources" (News

release, September 2 2015. The original work done in by TetraTech for New Edge Gold was never filed with SEDAR as an NI 43-101, and although the March 2015 Lucky Minerals document titled as an NI 43-101 can be found on SEDAR, it was not actually filed as a technical report NI 43-101. The only NI 43-101 officially filed by Lucky Minerals was for the Vianey project in February 2013.

For the nine months preceding June 30, 2015, LJ paid Geologic Systems $179,000 for exploration and paid their CEO $25,000 for consulting services (MD&A, second quarter 2015).

Geologic risks to water quality

The only study reviewed was a report by Geologic Systems/Lucky Minerals that has not been certified NI 43-101 compliant, therefore conclusions are tentative.

The area is primarily volcanic, and the mineralization is from intrusions of calc-alkaline magma. This means the host rock contains iron, silica, calcium, magnesium, and possibly sodium as oxides. Despite the reference to "alkali", the calcium, etc. will not provide much buffering or neutralizing capacity in the oxide form. This would only occur if they were present in the carbonate form.

Minerals are found in two different types of occurrences: breccia pipes and porphyry systems. Both appear to be in host rock that is mostly silica. "Porphyry" refers to the way large and small crystallized silicates form as magmatic fluids infiltrated out into large areas of the host rock and cooled at different temperatures; breccia pipe refers to minerals contained within a cylindrical column embedded in the host rock. Essentially, the minerals in the Emigrant District are found across a generally wide area in the Emigrant Peak/Emigrant Creek area, and more condensed in breccia pipes at ten locations. Both porphyry and breccia locations can be high in pyrite (FeS_2), which would put the area at high risk of acid drainage if mining were to occur, particularly as there is apparently no or little carbonates to neutralize acid.

All the mineralization, whether as porphyry or in breccia, appears to be sulfide-based: Chalcopyrite ($CuFeS_2$), covellite (CuS), galena (PbS), chalcocite (Cu_2S), molybdenite (MoS_2), and sphalerite (ZnS). In the breccias, these may be moly cores with copper-gold outer haloes zoning finally into lead-zinc.

Note: There is a serious risk for acid drainage and possibly metals leaching, given high pyrite in host rock and mineral zones with apparently low acid-buffering capability.

Some notes on the breccia pipe deposits:

> Lucky Minerals has "9 patented mineral claims under option" at St. Julian – which apparently has not produced minerals (gold) since 1903, and had some minor drilling (27 holes, 14,000 feet) done in 1973 and 1992. Pyrite occurs throughout the area (from "trace to 2%"), making it a potential acid drainage risk. Nearly all the breccia pipe drilling occurred here. This is the first area Lucky wants to target in a $2.5 million drilling exploration project, with $5 million to be spent later. Gold is found associated with the pyrite.
>
> Allison Tunnel (moly core, some copper) is a small system, possibly only 150' across. Only five holes were drilled (1973, 1992). LJ has two or three claims in this area.
>
> Great Eastern/Base Metal (lead-zinc) had 15 holes drilled, with at least one hole drilled in 1990s. This breccia may be about 600 feet wide and up to 1,600 feet deep. LJ has claims in this area all purchased in 2014.

Peter Pear (copper-moly) had two holes drilled by Pegasus in 1992. Some gold may be present within quartz or associated with pyrite and arsenopyrite. It may be an extension of the Allison Tunnel area. LJ has two claims that may touch on part of, but not on the bulk of, this deposit.

Montana Queen & Corbett had some underground mining conducted prior to 1904 in areas with pyrite. These areas are part of the claims staked in 2014.

Some notes on the porphyry deposits:

Emigrant Peak has high sulfide host rock and sulfide minerals (molybdenum, lead, copper) as porphyry and veins, starting with a copper-moly core and becoming lead-zinc in the outer zone. This area has high sulfide (2-5% of rock mass), possibly a mile wide. Apparently only one hole was drilled (AMAX, 1963). LJ staked many claims in this area in 2014.

DUV (gold-copper) is a small location where they staked claims in 2014. An old adit in the area is known to have 5%-15% pyrite, which poses a very high acid risk, and a reference to "hydrous copper sulfate crusts" at the portal could potentially be similar to the type of efflorescent minerals formed in the extremely acidic environment of Iron Mountain, which is worrisome. Nearly all the porphyry drilling occurred here (33 holes, 16,000 feet).

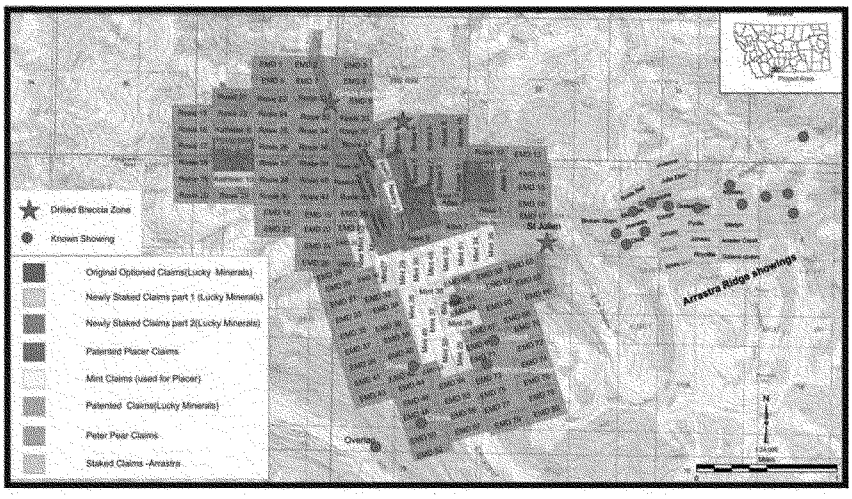
Summary

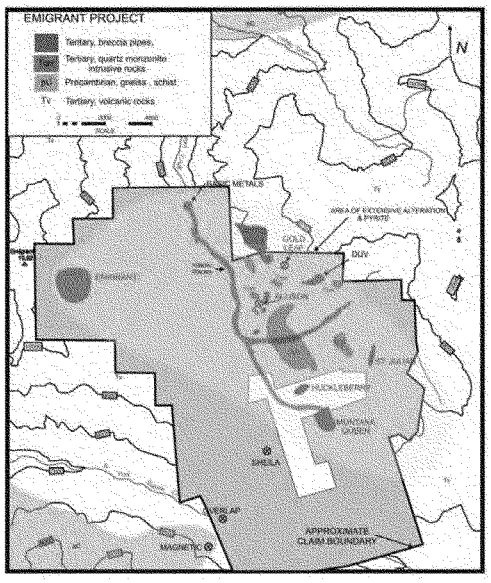
The overall picture is one of a company with a history of cash flow problems, but has aggressively staked claims in an area with ore in high sulfide deposits. This is a troubling combination. The next two years will show if the re-structured company is able to continue the payment plans they have set up, as historically they often are forced to drop properties within two years due to an inability to pay. They intend to focus initially on the St. Julian breccia, but it is completely unrealistic for them to set up a $2.5 million exploration program. If they apply for access road permits, watch for possible acid drainage during road construction.

Regards,

Kendra Zamzow, PhD

<u>Claims and Ore Deposits</u> (Figure 3 and Figure 4 of the March 2015 Technical report)





SEDAR references

Form 2B Listing Application

June 2009 – form to list Lucky Minerals (under "LJ") on the Toronto Exchange (TSX)

Interim financial statement

June 2015 – current operating assets

Management's Discussion and Analysis (MD&A)

Second quarter 2009 – announces listing on TSX
First quarter 2011 – announces relinquishment of Nicos property
Third quarter 2012 – announces relinquishment of Peru properties
First quarter 2014 – announces relinquishment of Parnes property
Second quarter 2015 – announces relinquishment of Vianey property, purchase agreement for Emigrant claims, and payments for consulting services

News releases on SEDAR

June 2009 – Lucky Minerals listed on TSX as LJ
June 2010 – announce purchase option for Josefina property
August 2010 – announce purchase option for Silver Mt. property
October 2010 – announce purchase option for Hunter property
December 2010 – announce relinquishment of Hunter property
July 2014 – announces relinquishment of Parnes property
January 2015 – announces purchase agreement on Vianey property

Purchase option agreement

March 2011 – Patricia Parnes agreement

MBMG Ground Water Open-File Report 23 2016

BASELINE WATER-QUALITY INVESTIGATION, EMIGRANT CREEK WATERSHED, SOUTH-CENTRAL MONTANA

John I. LaFave

Montana Bureau of Mines and Geology
1300 West Park St
Butte, MT 59701

Contents

Abstract 1

Introduction 1

Study Area 1

Methods 4

Results 6

Surface Water 10

Springs 13

Groundwater 13

Isotopes 13

Geothermal Impacts 14

Summary 18

Acknowledgments 18

References 18

Figures

Figure 1. Location map. Emigrant Creek is a small northward flowing tributary to the Yellowstone River 2

Figure 2. Site map. Geology modified from Berg and others (1999) 3

Figure 3. Sample sites 5

Figure 4. Piper plot showing relative percentage of major ions in water samples from the Emigrant Creek drainage 6

Figure 5. Individual value plot of total dissolved solids and sulfate versus pH 10

Figure 6. Surface-water sites: with total dissolved solids, pH, and discharge in cubic feet per second (cfs) 11

Figure 7. Surface-water Piper plot showing relative percent of major ions based on milliequivalents per liter 12

Figure 8. Stable isotope composition of groundwater, surface water, and springs 14

Figure 9. Histogram of tritium values from groundwater, surface water, and spring samples 15

Figure 10. Regional geologic map modified from Berg and others (1999) with geothermal sites and Chico Hot Springs water quality.....16

Figure 11. Stable isotope composition of Emigrant water and Chico Hot Springs 17

Table

Table 1A. Site data 7

Table 1B. Field parameters, isotopes, and major ions.....8

Table 1C. Trace metals.....9

Table 1D. Gauging data.....10

Cover image: Emigrant Peak, south-central Montana.

ABSTRACT

The Montana Bureau of Mines and Geology collected water samples from 17 sites in the Emigrant Creek watershed in south-central Montana to establish baseline water-quality conditions. Samples were collected from three boreholes, seven springs, six stream locations, and one adit discharge. They were analyzed for major ions, trace metals, stable-water isotopes of oxygen and hydrogen, and tritium.

The total dissolved solids concentrations for the groundwater and surface-water samples ranged from 59 to 271 mg/L. Acidic (field pH < 3.0), metal-rich, SO_4-type water was observed in the Allison Tunnel adit discharge and two nearby springs. Moderately acidic (pH 5.8–6.1), Ca-Mg-SO_4-HCO_3-type water was observed in two samples from the East Fork of Emigrant Creek and in samples from two springs in the East Fork drainage near the St. Julian Mine. Surface-water samples from Emigrant Creek, and spring and groundwater samples from the Emigrant Creek drainage, had neutral pH's (7.2–7.8) and Ca-Mg-HCO_3-SO_4-type water. Based on the geologic, hydrologic, and geochemical data, it is unlikely that water from the Emigrant Creek watershed is connected to the geothermal system that feeds Chico Hot Springs.

INTRODUCTION

In June 2015, Lucky Minerals, Inc. submitted a mineral exploration plan to assess the presence of base and precious metals in the Emigrant Creek watershed, approximately 7 mi SE of Emigrant, Montana (fig. 1). The plan called for exploratory drilling in two areas on unpatented claims on U.S. Forest Service lands (DUV and Emigrant), and on private land of the St. Julian patented claims (fig. 2). In December 2015, Lucky Minerals withdrew its permit application for drilling on U.S. Forest Service lands.

The purpose of this investigation was to characterize the water quality in the Emigrant Creek and East Fork of Emigrant Creek drainages prior to the proposed drilling. This report describes the baseline water-quality and stable isotope data collected during this investigation, and evaluates potential impacts that the drilling may have on nearby geothermal features.

STUDY AREA

The Emigrant Creek watershed is located in Park County along the western edge of the Absaroka Mountains in the Gallatin National Forest. Emigrant Creek is tributary to the Yellowstone River and drains rugged mountainous terrain covering about 13,400 acres. The climate includes warm summers and cold winters, with a mean average annual temperature of 35°F; the watershed receives 25 to 35 in of precipitation annually, mostly in the form of snow (PRISM, http://www.prism.oregonstate.edu/). Within the watershed, the elevation ranges from 5,500 ft near Old Chico to 10,915 ft at Emigrant Peak. The East Fork of Emigrant Creek separates the DUV and St. Julian exploration areas (fig. 2).

An Eocene intrusive complex forms Emigrant Peak, underlies much of the Emigrant Creek drainage, and is the host rock for the Emigrant–Mill Creek mining district. The Emigrant Stock is principally dacitic and has intruded Precambrian gneiss and schist, Paleozoic sedimentary rocks, and Tertiary volcanic rocks. Pyritic mineralization and intense hydrothermal alteration are prevalent within the Emigrant complex (Van Gosen and others, 1993; Elliot and others, 1983). A granodiorite porphyry intrudes the dacite and is exposed near the Allison Tunnel on the north side of the East Fork of Emigrant Creek (fig. 2); veins of quartz containing sulfide mineralization were noted at the tunnel (Elliot

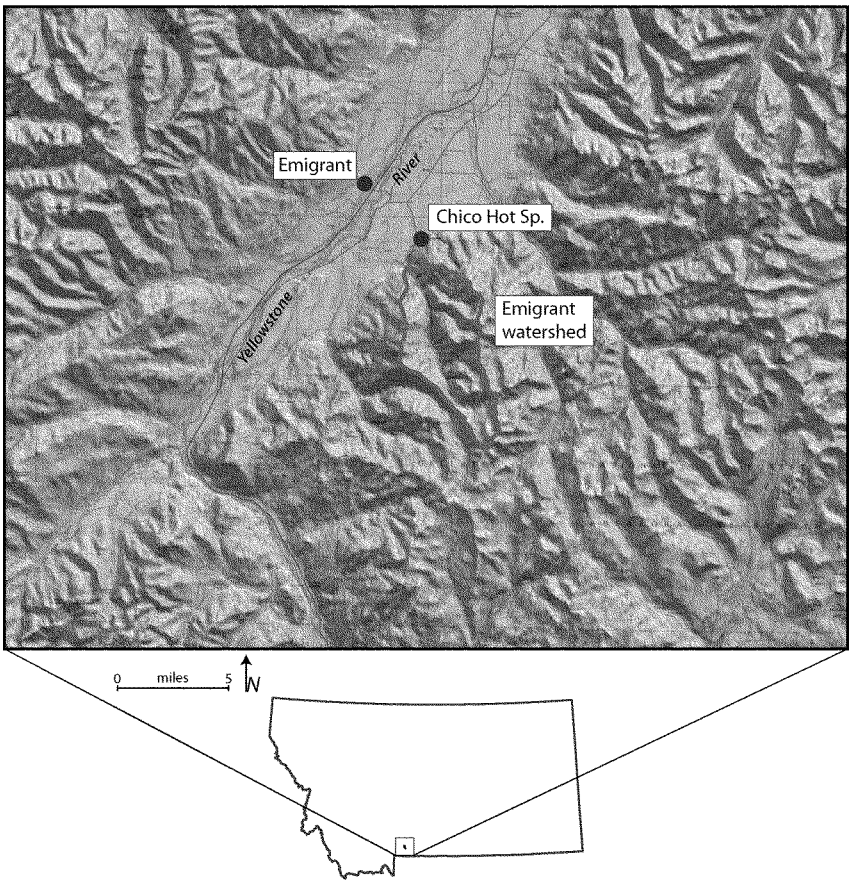


Figure 1. Location map. Emigrant Creek is a small northward flowing tributary to the Yellowstone River.

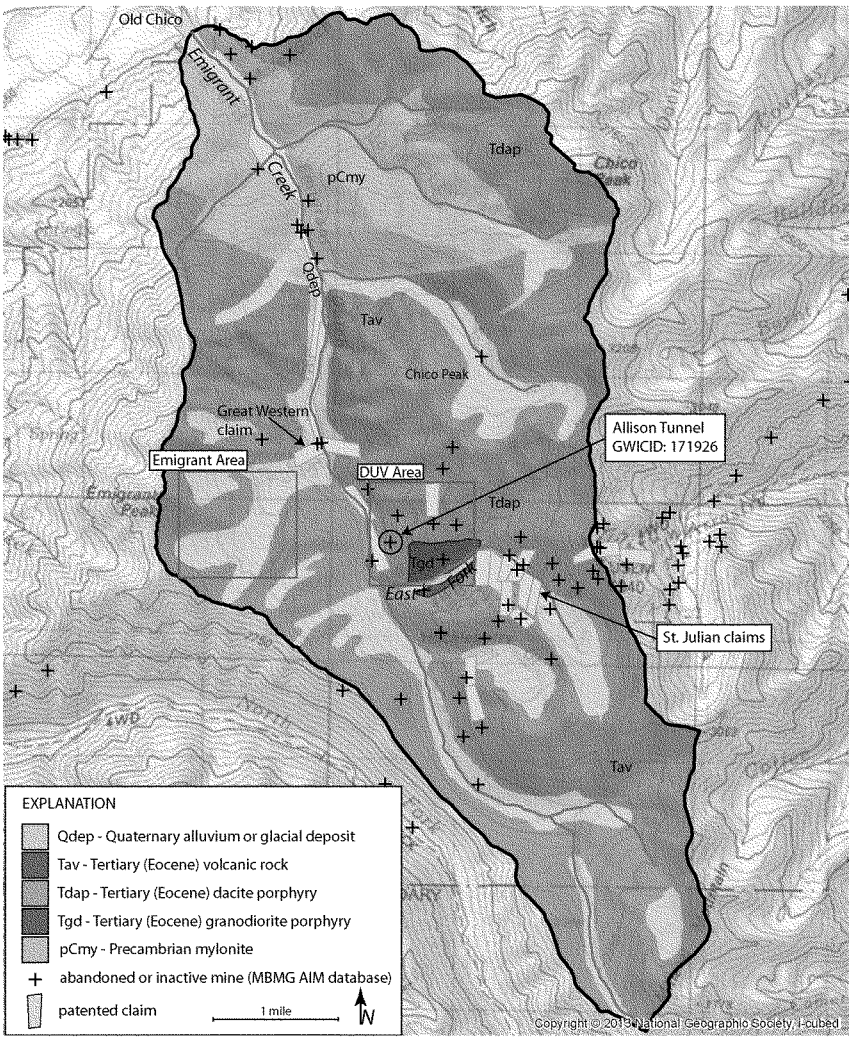


Figure 2. Site map, Geology modified from Berg and others (1999).

and others, 1983). The Allison Tunnel was driven into Tertiary dacite to intercept a copper–molybdenum-bearing breccia pipe, and is associated with an area of "strong pyrite alteration" (Hargrave and others, 2000). Detailed descriptions of the geology, alteration, and mineralization are in Elliot and others (1983).

The Emigrant Creek mining district has a long history of placer and hard rock mining (Stotelmeyer and others, 1983). Mineral deposits associated with the Emigrant Stock consist of stockwork, breccia-pipe, and vein-type deposits; peripheral to the stock, mineralization is mostly vein and replacement types (Hargrave and others, 2000). There are records of 48 abandoned or inactive mines in the Emigrant watershed (fig. 2) and 83 boreholes from prior exploration activity (Geologic Systems, 2015; MBMG Abandoned Mines Database). Patented placer claims lie along most of lower Emigrant Creek below the East Fork confluence. Most abandoned lode claims are in the East Fork and upper part of Emigrant Creek, and their locations suggest an overall northeast-trending structural control on mineralization (fig 2). More information on the abandoned and inactive mines in the watershed is in Hargrave and others (2000) and USGS (1993).

METHODS

Investigators from the Montana Bureau of Mines and Geology (MBMG) selected surface water and spring sites that bracketed areas of potential mineral exploration. The MBMG collected water samples at six stream sites along the East Fork and main stem of Emigrant Creek during baseflow conditions on October 23–30, 2015, and from seven springs. The spring sites were selected because of their proximity to the proposed drilling. In addition to the streams and springs, the MBMG sampled three flowing artesian boreholes, and the discharge from the Allison Tunnel (fig. 3). Although Hargrave and others (2000) reported three flowing boreholes near the St. Julian Mine, only two were flowing in the fall of 2015. Iron staining around the third borehole suggested recent flow. The third borehole was blocked and there was no access for sampling and water-level measurement. A borehole near the Great Western claim adjacent to FS Road 3272 below the Emigrant exploration area provided the third borehole sample.

The sample locations were grouped by their proximity to the proposed exploration areas. Three sites (two springs and the Allison Tunnel discharge) were sampled in the DUV area; six sites (two boreholes, two springs, and two surface-water sites) were sampled in the St. Julian claims area; and eight sites (one borehole, three springs, and four surface-water sites) were sampled in the Emigrant area.

At each site measurements of pH, specific conductance, temperature, redox potential, and dissolved oxygen were obtained; at the surface-water sites stream discharge was also measured. Samples were collected by pumping water through a 0.45-µm canister filter into pre-cleaned polyethylene bottles. Samples bottled for metals analysis were acidified using concentrated nitric acid, and samples for nitrate analysis were preserved using sulfuric acid; samples for anions, alkalinity, and isotopes were unpreserved.

All samples were analyzed for major ions, nutrients, and trace elements by the MBMG Analytical Laboratory (EPA methods 200.7, 200.8, and 300.0), and results are reported as "dissolved." Hydrogen (^{2}H and ^{3}H) and oxygen (^{18}O) isotope samples were analyzed at the University of Waterloo Environmental Isotope Laboratory.

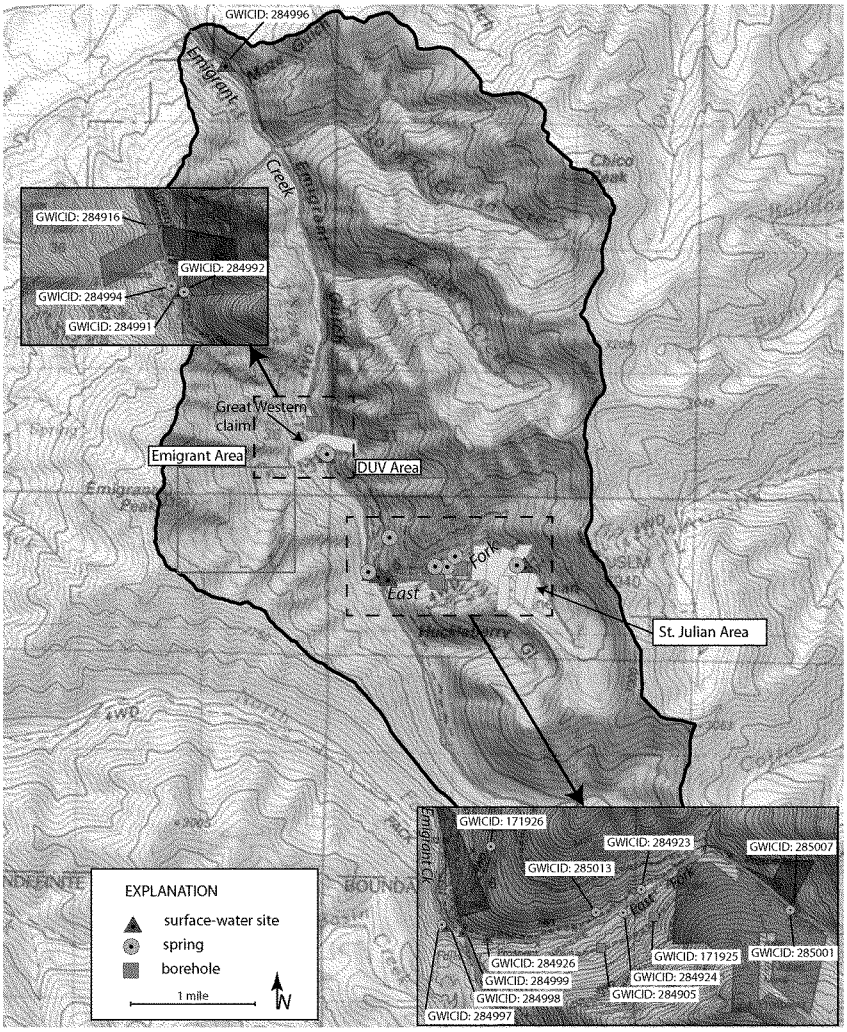


Figure 3. Sample sites. See table 1 to relate GWIC ID to site name. The Allison Tunnel is GWIC ID 171926.

RESULTS

The major ion and trace metal results for the surface-water, groundwater, and spring sites are presented in table 1. Most of the water is a Ca-Mg- HCO_3- SO_4-type; however, at three sites nearly the entire anionic charge was derived from SO_4 (fig. 4). Water from these sites also had pH < 3.0, and elevated concentrations of aluminum (Al), cadmium (Cd), copper (Cu), and zinc (Zn). For the surface-water, groundwater, and spring samples, total dissolved solids concentrations (TDS) ranged from 59 to 271 mg/L, and pH ranged from 2.8 to 7.8 (fig. 5). Although the TDS concentrations in water from all sites were < 300 mg/L, the water quality varies based on source (surface water or groundwater) and geographic area/geology.

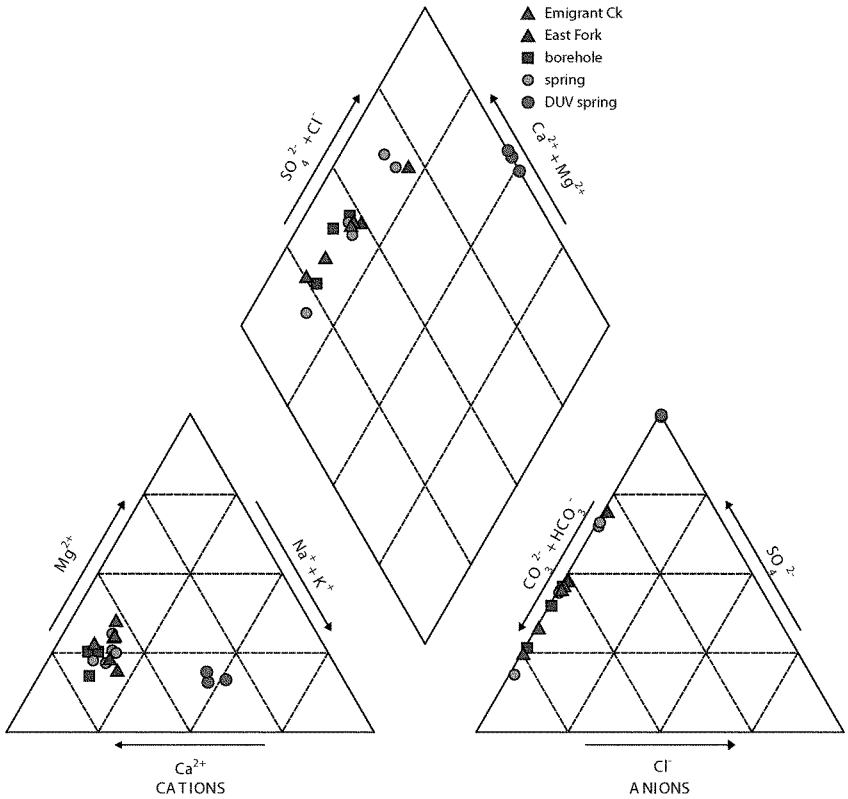


Figure 4. Piper plot showing relative percentage of major ions (in milliequivalents per liter) in water samples from the Emigrant Creek drainage.

Table 1A. Site data.

GWIC ID	Sample ID	Sample Date	Site Name	Site Type	Area	Latitude	Longitude	Altitude	Township	Range	Section	Qsection
171925	210336	10/23/2015	EMIGRANT MINING DISTRICT -DUV UPPER BOREHOLE	BOREHOLE	SJ - BH	45.2550	-110.6565	7799	07S	09E	5	CBBC
171926	210330	10/28/2015	ALLISON TUNNEL	MINE DRAINAGE	DUV	45.2585	-110.6683	7650	07S	09E	6	BDAD
284905	210332	10/23/2015	EMIGRANT MINING DISTRICT DUV- MIDDLE BOREHOLE	BOREHOLE	SJ - BH	45.2534	-110.6603	7642	07S	09E	6	
284916	210331	10/23/2015	GE/GW BOREHOLE	BOREHOLE	E - BH	45.2716	-110.6811	6800	06S	08E	36	AD
284923	210334	10/23/2015	EMIGRANT MINING DISTRICT EAST FORK NORTH GROUNDWATER	SPRING	DUV	45.2564	-110.6575	7595	07S	09E	5	BC
284924	210333	10/23/2015	EMIGRANT MINING DISTRICT EAST FORK SOUTH GROUNDWATER	SPRING	SJ	45.2552	-110.6588	7559	07S	09E	6	DA
284926	210335	10/23/2015	EAST FORK EMIGRANT CREEK ABOVE CONFLUENCE	STREAM	SJ	45.2538	-110.6685	7360	07S	09E	6	CA
284991	210327	10/29/2015	EMIGRANT CREEK ABOVE GREAT WESTERN	STREAM	E	45.2680	-110.6790	6857	06S	08E	36	D
284992	210329	10/29/2015	EAST SPRING SOUTH OF GREAT WESTERN #2	SPRING	E	45.2681	-110.6789	6874	06S	08E	36	D
284994	210323	10/29/2015	WEST SPRING SOUTH OF GREAT WESTERN #1	SPRING	E	45.2685	-110.6795	6864	06S	08E	36	D
284996	210324	10/30/2015	EMIGRANT CREEK AT PRIVATE BRIDGE	STREAM	E	45.3136	-110.6967	5561	06S	08E	13	CB
284997	210321	10/29/2015	SOUTH SPRING BELOW CONFLUENCE	SPRING	E	45.2544	-110.6718	7269	07S	09E	6	C
284998	210328	10/29/2015	EMIGRANT CREEK BELOW EAST FORK CONFLUENCE	STREAM	E	45.2543	-110.6715	7256	07S	09E	6	C
284999	210325	10/29/2015	EMIGRANT CREEK ABOVE EAST FORK	STREAM	E	45.2541	-110.6703	7282	07S	09E	6	C
285001	210322	10/28/2015	SAINT JULIAN #1	SPRING	SJ	45.2555	-110.6467	8082	07S	09E	5	D
285007	210326	10/28/2015	EAST FORK EMIGRANT CREEK ABOVE SAINT JULIAN	STREAM	SJ	45.2555	-110.6465	8066	07S	09E	5	D
285013	210320	10/28/2015	EAST FORK EMIGRANT CREEK ROAD SPRING	SPRING	DUV	45.2552	-110.6607	7557	07S	09E	6	D

Note. SJ, St. Julian; E, Emigrant.

Table 1B. Field parameters, isotopes, and major ions

Sample ID	GWIC ID	Sample Date	Site Name	Site Type	Area	Field Parameters: Water Temp °C	Field pH	Field SC µmhos	Field Redox mV	Dissolved Oxygen mg/L	Isotopes: $\delta^{18}O$	$\delta^{2}H$	^{3}H (TU)
210336	171925	10/23/2015	EMIGRANT MINING DISTRICT -DUV UPPER BOREHOLE	BOREHOLE	SJ	4.6	7.3	283.6	-75.2	2.4	-19.882587	-149.786515	8.5
210330	171926	10/28/2015	ALLISON TUNNEL	MINE DRAINAGE	DUV	3.5	2.9	262.6	446	8.64	-19.418997	-146.138914	11.9
210332	284905	10/23/2015	EMIGRANT MINING DISTRICT DUV- MIDDLE BOREHOLE	BOREHOLE	SJ	4.8	7.2	315.6	-60.8	0.36	-19.838568	-149.590546	5.8
210331	284916	10/23/2015	GE/GW BOREHOLE	BOREHOLE	E	4.7	7.5	289.3	-118.9	0.69	-19.508288	-145.112706	4
210334	284923	10/23/2015	EMIGRANT MINING DISTRICT EAST FORK NORTH GROUNDWATER	SPRING	DUV	5.5	2.9	279.3	487.2	8.55	-19.191116	-145.370516	9.8
210333	284924	10/23/2015	EMIGRANT MINING DISTRICT EAST FORK SOUTH GROUNDWATER	SPRING	SJ	6	5.8	127.1	243.9	7.35	-19.187933	-143.898716	9.7
210335	284926	10/23/2015	EAST FORK EMIGRANT CREEK ABOVE CONFLUENCE	STREAM	SJ	3.4	6.1	99.6	99.5	9.49	-18.994347	-143.029284	NA
210327	284991	10/29/2015	EMIGRANT CREEK ABOVE GREAT WESTERN	STREAM	E	3.1	7.8	125.1	123	9.48	-18.923329	-142.136686	NA
210329	284992	10/29/2015	EAST SPRING SOUTH OF GREAT WESTERN #2	SPRING	E	4.1	7.8	89.2	117.7	9.47	-18.111449	-135.901517	10.6
210323	284994	10/29/2015	WEST SPRING SOUTH OF GREAT WESTERN #1	SPRING	E	2.2	7.5	102.4	123.9	9.78	-18.416823	-136.894332	8.6
210324	284996	10/30/2015	EMIGRANT CREEK AT PRIVATE BRIDGE	STREAM	E	3.7	7.1	142.6	137.4	10.36	-18.392619	-138.928941	9.4
210321	284997	10/29/2015	SOUTH SPRING BELOW CONFLUENCE	SPRING	E	2.3	7.4	128.6	106.6	9.68	-18.468591	-138.642108	8
210328	284998	10/29/2015	EMIGRANT CREEK BELOW EAST FORK CONFLUENCE	STREAM	E	2.9	7.2	143.1	74.5	9.64	-18.938873	-142.459295	NA
210325	284999	10/29/2015	EMIGRANT CREEK ABOVE EAST FORK	STREAM	E	1.8	7.2	132.5	122.9	9.88	-18.913833	-141.244158	8.2
210322	285001	10/28/2015	SAINT JULIAN #1	SPRING	SJ	2.1	5.9	176.4	356	9.13	-19.34459	-144.731448	6.5
210326	285007	10/28/2015	EAST FORK EMIGRANT CREEK ABOVE SAINT JULIAN	STREAM	SJ	1.6	6.0	84	344.7	9.11	-18.829676	-140.905537	9.6
210320	285013	10/28/2015	EAST FORK EMIGRANT CREEK ROAD SPRING	SPRING	DUV	5.7	2.8	285.7	486.2	5.84	-19.295876	-146.912915	11

Sample ID	GWIC ID	Major Ions (mg/L): Ca	Mg	Na	K	Fe	Mn	SiO_2	HCO_3	CO_3	Cl	SO_4	NO_{3_n}	F	OPO_4	TDS	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$
210336	171925	37.56	8.79	5.91	0.82	0.393	0.467	19.03	112.07	0	0.490 J	58.7	<0.010 U	0.49	<0.020 U	186.5	130.0	91.9
210330	171926	5.55	1.76	6.84	1.84	5.124	5.409	49.96	0	0	0.73	189	<0.010 U	0.13	<0.020 U	270.8	21.1	0.0
210332	284905	39.15	9.56	8.25	0.86	0.42	0.514	19.68	109.99	0	0.65	74.28	<0.010 U	0.78	<0.020 U	208.9	137.1	90.2
210331	284916	37.13	5.82	8.33	0.53	0.233	0.256	15.48	138.55	0	0.63	39.58	<0.010 U	1.29	<0.020 U	177.4	116.7	114.0
210334	284923	4.82	1.21	5.46	2.53	0.295	0.313	52.54	0	0	0.57	172.3	0.14	0.17	<0.020 U	247.4	17.0	0.0
210333	284924	13.18	3.44	4.06	0.82	<0.015 U	0.005 J	20.17	25.38	0	0.450 J	39.73	0.2	0.14	<0.020 U	94.1	47.1	20.5
210335	284926	9.87	1.89	3.4	0.83	0.185	0.212	17.67	18.84	0	0.480 J	33.77	0.09	0.19	<0.020 U	77.4	32.4	15.6
210327	284991	12.63	3.98	3.38	0.66	0.038 J	0.029 J	15.88	40.82	0	0.480 J	27.3	0.08	0.1	<0.020 U	83.9	47.9	33.6
210329	284992	10.53	2.79	3.05	0.41	<0.015 U	0.015 J	11.94	45.09	0	0.490 J	8.04	0.29	0.23	<0.020 U	58.5	37.8	36.9
210323	284994	11.82	2.5	2.31	0.46	<0.015 U	<0.002 U	10.25	20.33	0	0.360 J	29.97	0.28	0.09	<0.020 U	66.2	39.8	16.4
210324	284996	16.11	4.77	3.05	0.64	<0.015 U	0.015 J	11.61	68.01	0	0.480 J	17.08	0.16	0.13	<0.020 U	89.4	64.9	55.8
210321	284997	12.46	4.22	3.15	0.4	<0.015 U	0.006 J	11.15	42.65	0	0.400 J	27.25	0.2	0.18	<0.020 U	78.9	48.5	35.3
210328	284998	13.27	4.26	3.54	0.74	0.055 J	0.055	16.83	42.4	0	0.490 J	27.06	0.07	0.07	<0.020 U	87.3	50.7	34.4
210325	284999	13.5	5.32	3.36	0.62	0.050 J	0.032 J	15.4	56.1	0	0.500 J	21.3	0.06	0.07	<0.020 U	86.5	55.6	45.9
210322	285001	21.21	4.52	5.92	0.67	<0.015 U	0.004 J	21.21	59.57	0	0.450 J	36.87	<0.010 U	0.51	<0.020 U	121.3	71.6	49.2
210326	285007	8.83	1.99	2.57	0.41	<0.015 U	0.007 J	12.61	26.15	0	0.410 J	18.78	0.13	0.06	<0.020 U	58.7	30.2	21.3
210320	285013	4.76	1.46	7.4	2.25	0.458	0.46	51.6	0	0	0.75	131.5	0.08	0.2	<0.020 U	206.6	17.9	0.0

Note. J, estimated quantity above detection limit but below reporting limit; U, undetected quantity below detection limit; mg/L, milligrams per Liter; SJ, St. Julian; E, Emigrant.

Table 1C. Trace metals.

Trace Metals (µg/L)

Sample ID	GWIC ID	Al	Sb	As	Ba	Be	B	Br	Cd	Cr	Co	Cu	Pb	Li	Mo	Ni	Se	Ag	Sr
210336	171925	8.880 J	<0.100 U	3	19.66	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	0.67	<0.500 U	1.5	4.980 J	<0.100 U	<0.100 U	<0.100 U	<0.100 U	314.29
210330	171926	3099.53	<0.100 U	1.34	8.27	0.62	<0.500 U	<10.000 U	3.08	<0.100 U	8.5	175.11	2.07	<2.000 U	<0.100 U	7.25	<0.100 U	<0.100 U	30.87
210332	284905	9.230 J	<0.100 U	3.53	10.31	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	0.410 J	<0.500 U	0.43	6.100 J	<0.100 U	<0.100 U	<0.100 U	<0.100 U	283.32
210331	284916	8.960 J	<0.100 U	6.96	21.23	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	<0.500 U	<0.060 U	9.460 J	1.66	<0.100 U	<0.100 U	<0.100 U	361.31
210334	284923	6402.78	<0.100 U	<0.100 U	23.73	0.380 J	<0.500 U	<10.000 U	2.69	<0.100 U	3.84	346.04	2.46	<2.000 U	<0.100 U	3.67	<0.100 U	0.260 J	32.87
210333	284924	13.02	<0.100 U	0.240 J	30.44	<0.100 U	<0.500 U	<10.000 U	0.360 J	<0.100 U	<0.100 U	1.610 J	<0.060 U	<2.000 U	<0.100 U	0.88	<0.100 U	<0.100 U	80.25
210335	284926	151.12	<0.100 U	0.45	21.8	<0.100 U	<0.500 U	<10.000 U	0.47	<0.100 U	0.71	12.11	<0.060 U	<2.000 U	<0.100 U	0.7	<0.100 U	<0.100 U	53.29
210327	284991	46.64	<0.100 U	<0.100 U	52.4	<0.100 U	<0.500 U	<10.000 U	0.280 J	<0.100 U	0.260 J	5.74	<0.060 U	<2.000 U	<0.100 U	0.420 J	<0.100 U	<0.100 U	124.37
210329	284992	20.56	<0.100 U	0.47	12.37	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	<0.500 U	<0.060 U	2.690 J	1.03	<0.100 U	<0.100 U	<0.100 U	90.89
210323	284994	11.03	<0.100 U	0.280 J	28.57	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	4.08	<0.060 U	<2.000 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	61.26
210324	284996	23.06	<0.100 U	0.47	45.35	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	1.460 J	<0.060 U	<2.000 U	1.17	<0.100 U	<0.100 U	<0.100 U	161.34
210321	284997	9.060 J	<0.100 U	<0.100 U	33.72	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	<0.500 U	<0.060 U	<2.000 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	85.23
210328	284998	52.21	<0.100 U	<0.100 U	62.93	<0.100 U	<0.500 U	<10.000 U	0.370 J	<0.100 U	0.410 J	4.17	<0.060 U	<2.000 U	<0.100 U	0.6	<0.100 U	<0.100 U	145.9
210325	284999	92.11	<0.100 U	<0.100 U	88.21	<0.100 U	<0.500 U	<10.000 U	0.240 J	<0.100 U	0.270 J	0.960 J	<0.060 U	<2.000 U	<0.100 U	0.250 J	<0.100 U	<0.100 U	178.74
210322	285001	12.29	<0.100 U	0.44	26.09	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	<0.500 U	<0.060 U	2.820 J	<0.100 U	<0.100 U	<0.100 U	<0.100 U	212.19
210326	285007	10.53	<0.100 U	0.210 J	37.89	<0.100 U	<0.500 U	<10.000 U	<0.100 U	<0.100 U	<0.100 U	<0.500 U	<0.060 U	<2.000 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	46.24
210320	285013	5003.29	<0.100 U	<0.100 U	19.74	0.300 J	<0.500 U	<10.000 U	2.8	<0.100 U	6.26	555.6	0.58	<2.000 U	<0.100 U	5	0.410 J	<0.100 U	22.56

Sample ID	GWIC ID	Tl	Sn	Ti	V	Zn	Zr	Ce	Cs	Ga	La	Nd	Nb	Pd	Pr	Rb	Th	W	U
210336	171925	<0.100 U	<0.100 U	30.64	<0.100 U	26.07	<0.100 U	0.350 J	0.260 J	0.72	<0.100 U	0.230 J	<0.100 U	0.120 J	<0.100 U	1.67	<0.100 U	<0.100 U	1.56
210330	171926	<0.100 U	<0.100 U	2.68	<0.100 U	1182.9	<0.100 U	1.95	0.64	0.310 J	0.74	2.04	<0.100 U	0.210 J	0.310 J	11.26	<0.100 U	<0.100 U	1.76
210332	284905	<0.100 U	<0.100 U	27.59	<0.100 U	6.81	<0.100 U	<0.100 U	0.230 J	0.350 J	<0.100 U	<0.100 U	<0.100 U	0.220 J	<0.100 U	1.85	<0.100 U	0.240 J	0.97
210331	284916	<0.100 U	<0.100 U	24.86	<0.100 U	1.490 J	<0.100 U	<0.100 U	<0.100 U	0.77	<0.100 U	<0.100 U	<0.100 U	0.250 J	<0.100 U	1.17	<0.100 U	1.19	1.11
210334	284923	0.280 J	<0.100 U	2.03	<0.100 U	629.65	<0.100 U	8.64	0.69	1.02	3.84	5.19	<0.100 U	<0.100 U	1.17	12.75	<0.100 U	<0.100 U	0.85
210333	284924	<0.100 U	<0.100 U	10.24	<0.100 U	109.77	<0.100 U	<0.100 U	<0.100 U	1.3	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	2.16	<0.100 U	<0.100 U	<0.100 U
210335	284926	<0.100 U	<0.100 U	1.92	<0.100 U	117.99	<0.100 U	<0.100 U	<0.100 U	0.95	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	3	<0.100 U	<0.100 U	<0.100 U
210327	284991	<0.100 U	<0.100 U	9.64	<0.100 U	49.9	<0.100 U	<0.100 U	<0.100 U	2.15	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	1.72	<0.100 U	<0.100 U	<0.100 U
210329	284992	<0.100 U	<0.100 U	1.24	<0.100 U	3.8	<0.100 U	<0.100 U	<0.100 U	0.53	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	0.92	<0.100 U	<0.100 U	0.280 J
210323	284994	<0.100 U	<0.100 U	9.38	<0.100 U	14.37	<0.100 U	<0.100 U	<0.100 U	1.2	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	1.55	<0.100 U	<0.100 U	<0.100 U
210324	284996	<0.100 U	<0.100 U	16.16	<0.100 U	14.42	<0.100 U	<0.100 U	<0.100 U	1.93	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	1.13	<0.100 U	<0.100 U	0.72
210321	284997	<0.100 U	<0.100 U	10.93	<0.100 U	4.3	<0.100 U	<0.100 U	<0.100 U	1.34	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	0.65	<0.100 U	<0.100 U	<0.100 U
210328	284998	<0.100 U	<0.100 U	11.16	<0.100 U	68.29	<0.100 U	<0.100 U	<0.100 U	2.64	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	2.21	<0.100 U	<0.100 U	<0.100 U
210325	284999	<0.100 U	<0.100 U	11.17	<0.100 U	35.38	<0.100 U	0.360 J	<0.100 U	3.69	0.250 J	<0.100 U	<0.100 U	<0.100 U	<0.100 U	1.53	<0.100 U	<0.100 U	<0.100 U
210322	285001	<0.100 U	<0.100 U	15.69	<0.100 U	8.62	<0.100 U	<0.100 U	<0.100 U	1.09	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	2.29	<0.100 U	<0.100 U	<0.100 U
210326	285007	<0.100 U	<0.100 U	2.43	<0.100 U	22.05	<0.100 U	<0.100 U	<0.100 U	1.49	<0.100 U	<0.100 U	<0.100 U	<0.100 U	<0.100 U	1.04	<0.100 U	<0.100 U	<0.100 U
210320	285013	0.250 J	<0.100 U	2.54	<0.100 U	818.49	<0.100 U	5.67	0.440 J	0.77	2.53	3.98	<0.100 U	<0.100 U	0.86	10.75	<0.100 U	<0.100 U	1.35

Note. J, estimated quantity above detection limit but below reporting limit; U, undetected quantity below detection limit; µg/L, micrograms per liter. Pink shaded cells, exceedance of acute aquatic-life standard (DEQ-7); yellow shaded cells, exceedance of chronic aquatic-life standard (DEQ-7).

Table 1D. Gauging data.

GWIC ID	Site Name	Site Type	Latitude	Longitude	Altitude	Date Measured	Discharge (cfs)
285009	EAST FORK EMIGRANT CREEK Below SAINT JULIAN	STREAM	45.25801	-110.65315	7769	10/28/2015	0.8
284926	EAST FORK EMIGRANT CREEK ABOVE CONFLUENCE	STREAM	45.2538	-110.6685	7360	10/23/2015	1.42
284999	EMIGRANT CREEK ABOVE EAST FORK	STREAM	45.25407	-110.67025	7282	10/29/2015	3.01
284998	EMIGRANT CREEK BELOW EAST FORK CONFLUENCE	STREAM	45.25434	-110.67149	7256	10/29/2015	4.21
284991	EMIGRANT CREEK ABOVE GREAT WESTERN	STREAM	45.26803	-110.679	6857	10/29/2015	5.43
284996	EMIGRANT CREEK AT PRIVATE BRIDGE	STREAM	45.313576	-110.696697	5561	10/30/2015	14.41

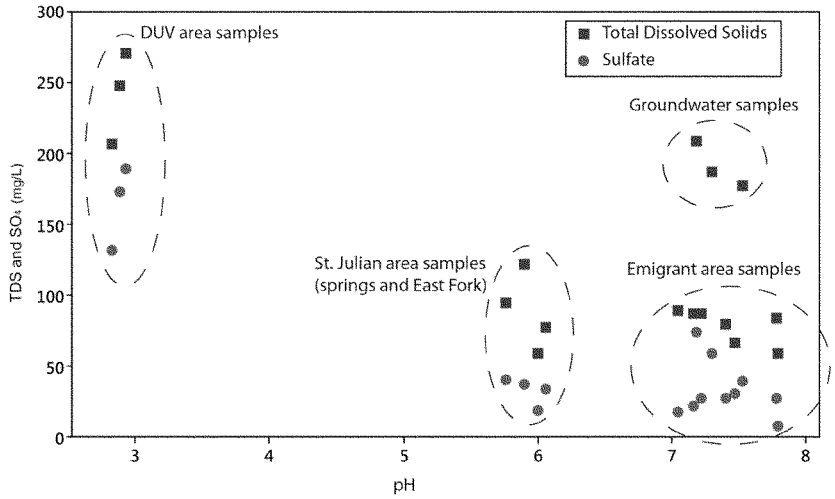


Figure 5. Individual value plot of total dissolved solids and sulfate versus pH.

SURFACE WATER

Surface water was sampled at six locations, two on the East Fork and four on the main stem of Emigrant Creek. TDS concentrations ranged from 59 to 89 mg/L, and generally increased downstream (fig. 6). All of the surface-water samples contained dissolved oxygen > 9 mg/L; pH in the two East Fork samples (6.0 and 6.1) was lower than those in the Emigrant Creek samples (range 7.1 to 7.8). Alkalinity concentrations in the East Fork samples were 15.58 and 21.32 mg/L as HCO_3, and lower than alkalinities in the Emigrant Creek samples (34 to 58 mg/L). Sulfate was relatively enriched in the East Fork samples (fig. 7); in the sample from above the East Fork's confluence with the main stem of Emigrant Creek (GWIC ID: 284926), Cu and Zn concentrations exceeded acute aquatic-life standards (MDEQ, 2012) and Al and Cd exceeded the chronic aquatic-life standards (table 1). The relatively low pH, enriched sulfate, and elevated metals concentrations in samples from the East Fork are likely related to acidic drainage from the north side (DUV area) of the East Fork of Emigrant Creek (fig. 2).

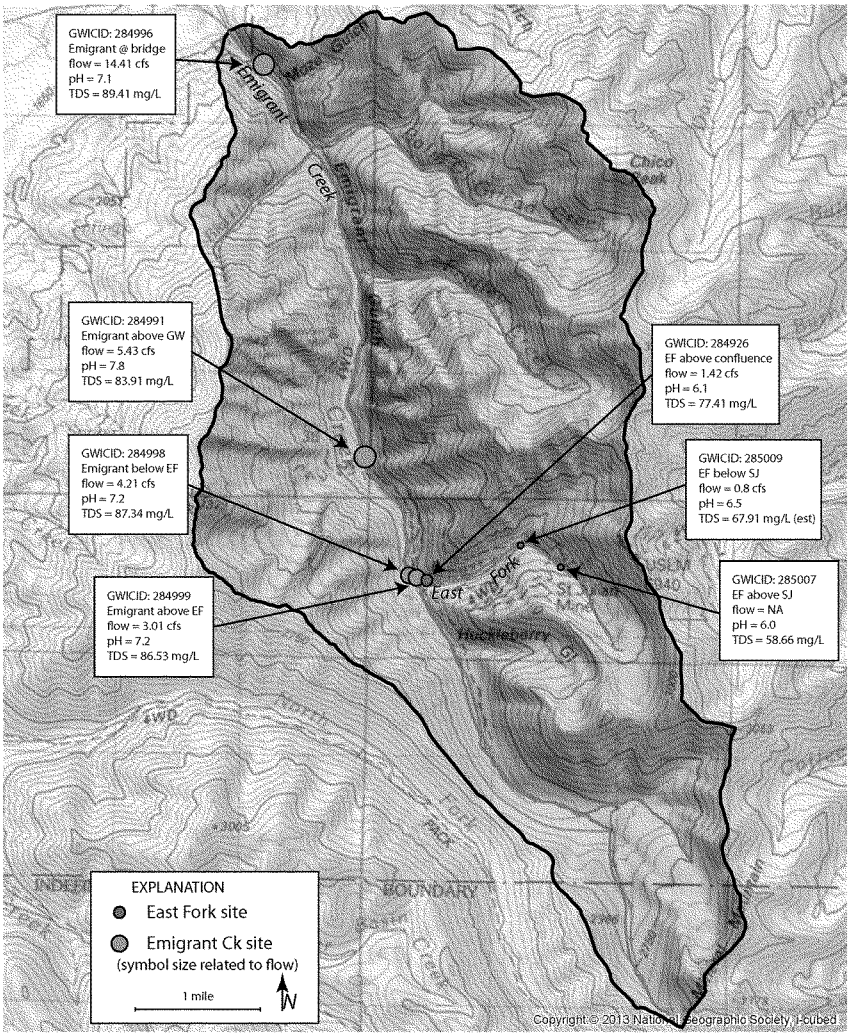


Figure 6. Surface-water sites: with total dissolved solids, pH, and discharge in cubic feet per second (cfs).

Samples from the main stem of Emigrant Creek had pH values between 7.1 and 7.8, low TDS concentrations (84 to 89 mg/L), and were of a Ca-Mg- HCO_3-type water (fig. 4). The Zn concentration in the sample below the East Fork confluence (GWIC ID: 284998, fig. 3) exceeded the acute aquatic-life standard; however, concentrations of Al, Cu, and Zn generally decreased downstream.

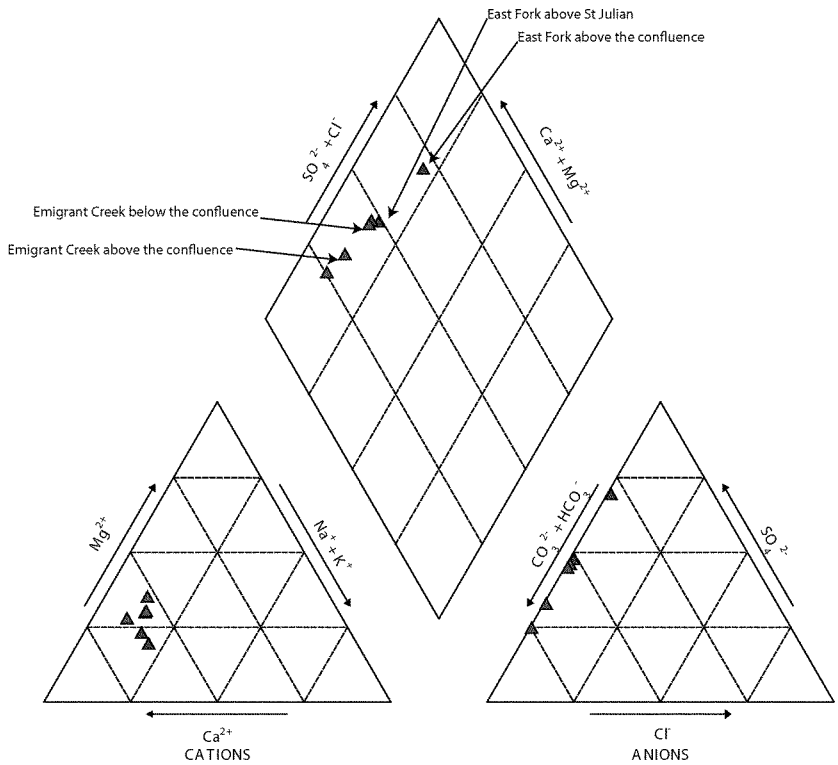


Figure 7. Surface-water Piper plot showing relative percent of major ions based on milliequivalents per liter. Purple, East Fork samples; blue, Emigrant Creek samples.

SPRINGS

Springs occur throughout the watershed, typically in close proximity to streams (fig. 3). Seven springs and the Allison Tunnel discharge were sampled. Two springs and the tunnel discharge occur north of the East Fork in the DUV area; two other springs occur south of the East Fork in the St. Julian area. Three springs occur in the Emigrant area, one below the confluence of the East Fork and Emigrant Creeks, and two above the Great Western Claim on the north and south sides of Emigrant Creek (fig. 3).

Water from the three sites in the DUV area had distinctly low pH values (< 3.0); elevated TDS, SO_4, Al, Cd, Cu, and Zn concentrations; and no detectable alkalinity. The TDS concentrations ranged from 207 to 271 mg/L, and the Al concentrations ranged from 3,100 to 6,423 µg/L. The discharge from the Allison Tunnel had iron (Fe) and manganese (Mn) concentrations of 5.1 and 5.4 mg/L, respectively—more than an order of magnitude greater than the other two springs in the DUV area. All three sites exceeded the acute aquatic-life standards for Al, Cd, Cu, and Zn; the lead concentrations exceeded the chronic aquatic-life standard. These sites are near the granodiorite intrusive (Tgd on fig. 2) that contains pyrite and other sulfide mineralization. The analytical results suggest pyrite oxidation and other sulfides in the host rock are the source of the acidity, elevated SO_4, and trace metals.

Samples from the two springs in the St. Julian area were moderately acidic (pH 5.8 and 5.9) and had TDS concentrations of 94 and 121 mg/L. Water from both springs was a Ca-Mg- HCO_3- SO_4–type (fig. 4); the zinc concentration in the spring south of the East Fork (GWIC ID: 284924, fig. 3, table 1), across from the DUV area, exceeded the acute aquatic-life standard.

Water from the springs in the Emigrant drainage had neutral pH values (7.4–7.8), low TDS concentrations (59–79 mg/L), and was a Ca-Mg- HCO_3-type.

GROUNDWATER

Groundwater samples were collected from three flowing exploratory boreholes: two located in the St. Julian area and one in the Emigrant area above the Great Western claim next to FS Road 3272. The depths of the boreholes are unknown. The water quality is consistent among the borehole samples; it had neutral pH values (7.2–7.5), the highest measured alkalinity values in the watershed (90–114 mg/L as HCO_3), low dissolved oxygen concentrations (0.36–2.4 mg/L), relatively elevated TDS concentrations (177–209 mg/L, fig. 5) and was a Ca-Mg- HCO_3-type (fig. 4).

ISOTOPES

The $\delta^{18}O$ and $\delta^{2}H$ results are shown in figure 8; $\delta^{18}O$ values ranged from -19.88 to -18.11 per mille (‰), and the $\delta^{2}H$ values ranged from -152 to -134 ‰. The results plot along the meteoric water line, indicating the meteoric origin of the water; however, the isotopic values vary by source. The borehole groundwater samples have the smallest (lightest) values, followed by the spring samples from the DUV and St. Julian areas. The surface-water values from the East Fork and Emigrant Creek (upstream from the Great Western claim) were consistent and showed the well mixed condition of the surface water; the stream samples were slightly heavier than the groundwater and DUV/St. Julian spring samples. The three spring samples from the Emigrant Creek drainage (GWIC IDs: 284997, 284994, 284992, fig. 3) and the farthest downstream surface water sample (GWIC ID: 284996, fig. 3) are distinct and heavier than the other surface-water and spring samples.

The stable-isotope values can suggest the altitude and temperature of precipitation, as well as dif-

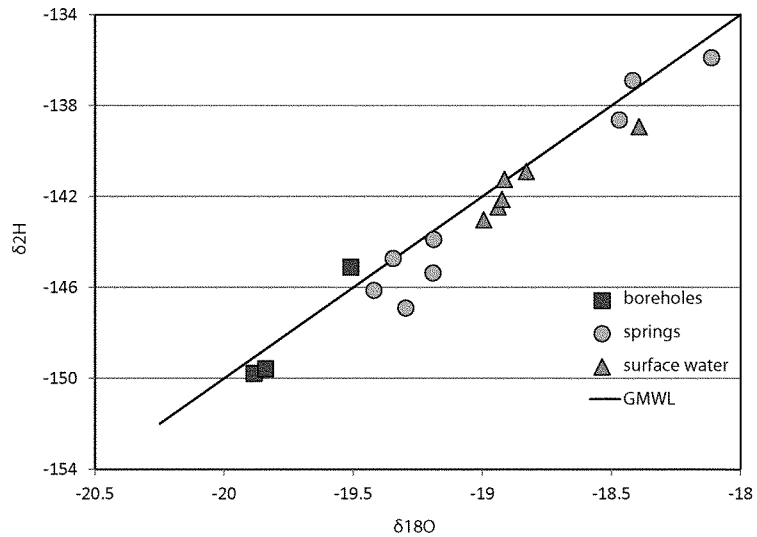


Figure 8. Stable isotope composition of groundwater, surface water, and springs.

ferent sources of groundwater recharge. The observed differences in values among the groundwater samples, springs in the upper watershed, springs in the lower watershed, and the surface-water samples highlight the variability of the groundwater flow system.

Tritium is a naturally occurring radioactive isotope of hydrogen that has a half life of 12.3 years. It is produced in the upper atmosphere, where it is incorporated into water molecules and therefore is present in precipitation that becomes groundwater recharge. Atmospheric testing of nuclear weapons between 1952 and 1963 released large amounts of tritium into the atmosphere, overwhelming the natural production. Because of its short half-life, tritium is an ideal marker of "recent" groundwater recharge; groundwater recharged prior to 1952 will not have detectable tritium. Groundwater recharged after the advent of above-ground nuclear testing will have detectable tritium. Tritium concentrations ranged from 4.0 to 11.90 tritium units (TU) (table 1 and fig. 9). The lowest values (between 4 and 6.5 TU) suggest that the oldest of the sampled waters were from two of the borehole samples and the St. Julian spring (GWIC ID: 285001). The remainder of the samples had values between 8 and 12 TU, which is consistent with recent precipitation and suggests that the water is very young.

GEOTHERMAL IMPACTS

Geothermal springs typically occur along faults that provide a pathway for deep circulating water. Chico Hot Springs occurs along the northeast-trending Emigrant fault zone along the western edge of the Beartooth uplift (fig. 10). The downthrown side of the fault is to the northwest and forms the Paradise Valley. Precambrian and Tertiary volcanic rocks of the Absaroka Mountains are on the upthrown side. Near Chico Hot Springs there is a localized occurrence of sedimentary rocks, including an outcrop of the Madison Limestone. The Madison Limestone could be important as it is a potential

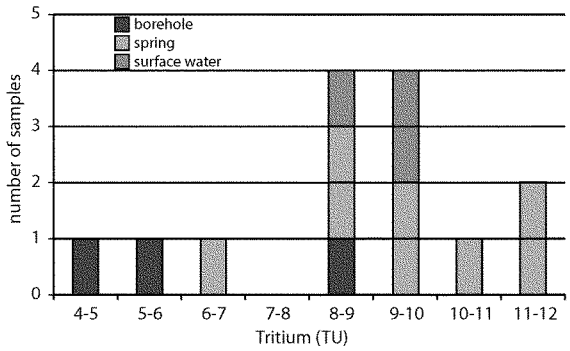


Figure 9. Histogram of tritium values from groundwater, surface water, and spring samples.

source of recharge water to other geothermal springs, such as Mammoth Hot Springs in Yellowstone National Park and Bear Creek Springs in the Corwin Springs Known Geothermal Resources Area (KGRA) about 14 mi south–southwest of Chico (Rye and Truesdell, 1993; Sorey, 1991). In the Corwin Springs KGRA, geothermal water discharged at Bear Creek is heated by deep circulation within zones of high geothermal gradient through sedimentary-rock aquifers. The presence of sedimentary rocks along the fault near Chico suggests a similar process may be responsible for the occurrence of Chico Hot Springs.

The proposed exploratory drilling raises questions about the location and configuration of the recharge area for Chico Hot Springs and the potential that deep boreholes might intercept or disrupt water that would otherwise reach the hot springs.

In the St. Julian area, angle or vertical drill holes up to 2,000 ft deep are proposed at 23 sites across the north-facing slope of the mountain that underlies the claims. The surface elevation of the proposed drill sites ranges from about 7,600 to 9,000 ft (DEQ Plan of Operations for Drilling on Private Land, April 2015). The drill sites are approximately 6 mi south–southeast of Chico Hot Springs, which lies at an elevation of 5,264 ft (fig. 10).

For the Emigrant Creek watershed to be a recharge area for Chico Hot Springs, the following geologic and hydrologic conditions must be met: (1) a sufficient source of water, (2) a permeability pathway to allow deep groundwater circulation between the recharge area and the springs, (3) a hydraulic gradient to drive water deep into the subsurface from the recharge area to the springs, and (4) a geothermal heat source.

The watershed receives 25–35 in of precipitation annually, mostly in the form of snow, and this precipitation is the source of surface flow and groundwater recharge. The large topographic relief of the watershed, about 5,000 ft, creates a steep topographic gradient between the upper catchment area and Chico Hot Springs. Groundwater flow in alpine watersheds most often occurs in near-surface, relatively high-permeability zones (active zones) that generally overlie deep zones of low permeability. The relatively high near-surface permeability is typically due to weathering and fracturing (Manning and Caine, 2008).

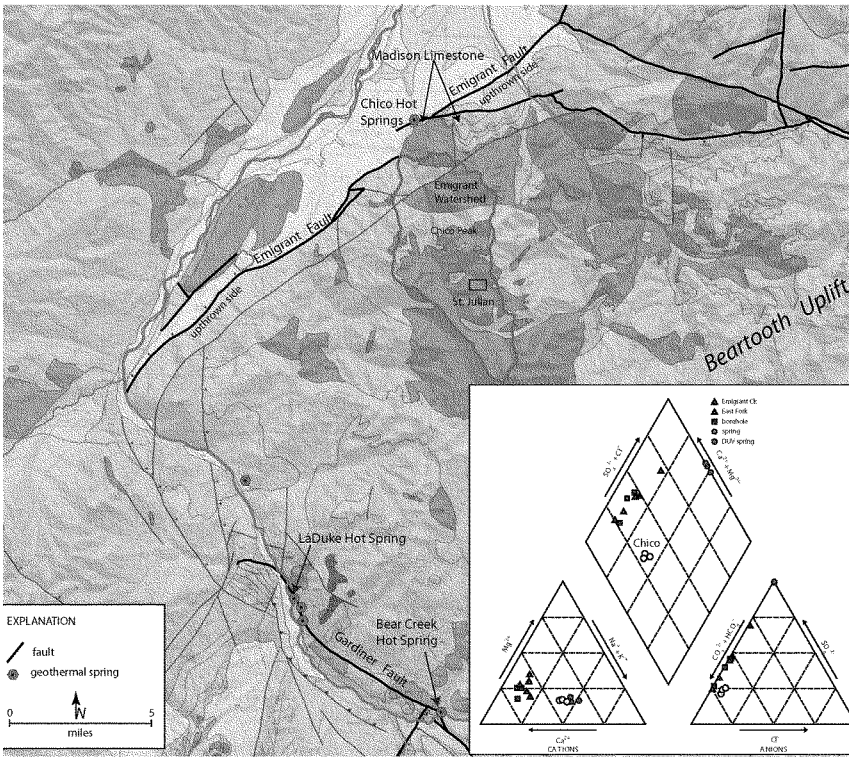


Figure 10. Regional geologic map modified from Berg and others (1999) with geothermal sites and Chico Hot Springs water quality.

The Emigrant Creek watershed is underlain by fractured crystalline bedrock. The near-surface bedrock is sufficiently fractured to host a groundwater flow system, as shown by the artesian boreholes that discharge cool (4.6–4.8°C), tritiated water. The steep topography creates hydraulic gradients that drive groundwater toward the topographic lows (valley bottoms). The measured increased flow in the East Fork and main stem of Emigrant Creek going downstream indicates that groundwater accounts for a significant component of surface-water flow.

Geologic evidence of a deep permeability pathway that could produce geothermal water is sparse. The prominent regional fault orientations trend northeast, normal to the watershed topographic profile, and there are no sedimentary rock units in the watershed (fig. 10). The basin contains only crystalline rocks that typically exhibit decreasing permeability with depth (Manning and Caine, 2008).

There is speculative evidence of a geothermal heat source beneath the watershed. Zilka (1983) reported that gravity and aeromagnetic surveys indicated a coincident gravity low and magnetic high near Chico Peak. Zilka speculates that these anomalies may indicate an eruptive center, consistent with the thick accumulation of volcanic rocks in the area and an area of anomalous geothermal heat flow. However, the cool water discharged from the artesian boreholes and the lack of geothermal features within the watershed suggests either no geothermal heat source or insufficient permeability to allow deep circulation and subsequent surface expression of geothermal water.

Water-quality data gathered during this investigation do not suggest connections between Emigrant Creek groundwater and the geothermal system feeding Chico Hot Springs. The water sampled in fall 2015 is chemically distinct from Chico Hot Springs water (fig. 10). Chico Hot Springs water is enriched in sodium and bicarbonate relative to the non-acidic waters in the Emigrant watershed; the stable isotope composition of Chico Hot Springs is shifted off the global meteoric water line and is relatively depleted compared to the Emigrant water samples (fig. 11). The distinct chemical and isotopic differences show that the geothermal system at Chico is separate from groundwater in the Emigrant drainage. It is unlikely that Chico Hot Springs receives significant recharge from the Emigrant Creek watershed.

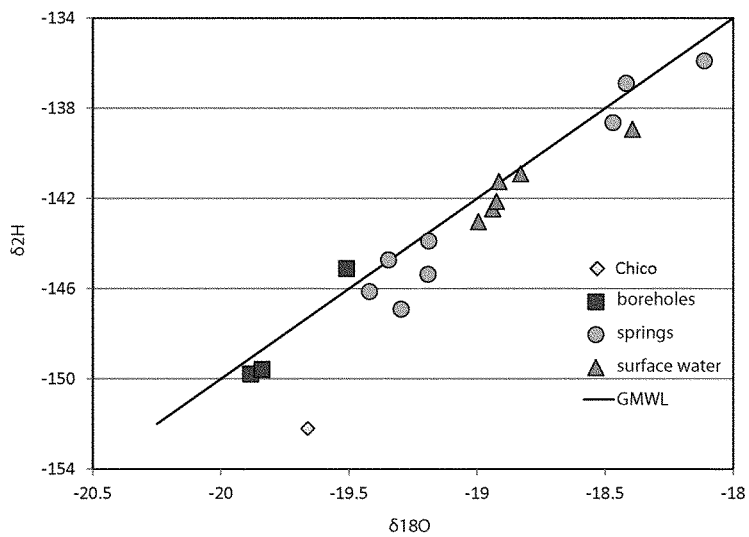


Figure 11. Stable isotope composition of Emigrant water and Chico Hot Springs.

SUMMARY

Groundwater and surface water were sampled in the Emigrant Creek watershed to establish baseline conditions. Samples were collected during the last week of October 2015 during base-flow conditions. Although all the sampled water had <300 mg/L total dissolved solids, dissolved constituents concentrations and the pH varied. Three samples from the DUV area had pH <3.0 and were dominated by sulfate and aluminum; concentrations of copper and zinc were also elevated. The local altered bedrock, associated with a granodiorite intrusive, appears to provide the conditions necessary to produce natural acid rock drainage from the DUV area that may cause the moderately low pH values observed in the East Fork of Emigrant Creek. Dilution and buffering result in more neutral pH's observed downstream in Emigrant Creek. Springs and groundwater samples from the St. Julian and Emigrant areas were characterized by low TDS concentrations, neutral pH values, and Ca-Mg- HCO_3-type water.

The proposed exploratory drilling in the St. Julian area, in the upper catchment of Emigrant Creek, is about 6 miles southeast of Chico Hot Springs, and about 2,500 feet higher in elevation. High elevation catchments can be important sources of groundwater recharge to adjacent lowland areas. However, there is no clear hydrogeologic or geochemical evidence to suggest that water from the Emigrant Creek watershed is connected to the geothermal system that feeds Chico Hot Springs.

ACKNOWLEDGMENTS

Special appreciation is extended to Mike Richter of the MBMG for his assistance in collecting the field data for this project. Robert Grosvenor of the US Forest Service provided guidance in locating sample sites. Reviews of this report by Garrett Smith, Thomas Patton and John Metesh improved clarity and content. Editing and layout by Susan Barth, MBMG.

REFERENCES

Berg, R.B., Lonn, J.D., and Locke, W.W., 1999, Geologic map of the Gardiner 30' x 60' quadrangle, south-central Montana: Montana Bureau of Mines and Geology Open-File Report 387, 11 p., 1 sheet, scale 1:100,000.

Elliot, J.E., Gaskill, D.L., and Raymond, W.H., 1983, Geological and geochemical investigations of the North Absaroka Wilderness Study Area, Park and Sweetgrass Counties, Montana, *in* Mineral Resources of the North Absaroka Wilderness Study Area, Park and Sweet Grass Counties, Montana: U.S. Geological Survey Bulletin 1505, p. 5–103.

Geologic Systems Ltd., 2015, The Emigrant Mining District Project, south central Montana: 43-101 Technical Report, unpublished, 88 p.

Hargrave, P., Kerschen, M., McDonald, C., Metesh, J.J., Norbeck, P.M., and Wintergerst, R., 2000, Abandoned-inactive mines program, Gallatin National Forest, Administered Lands: Montana Bureau of Mines and Geology Open-File Report 418, 199 p.

Manning, A.H., and Caine, J.S., 2008, Developing a conceptual model of ground-water flow in an alpine watershed, *in* Philip L. Verplanck, ed., Understanding contaminants associated with mineral deposits: U.S. Geological Survey Circular 1328, p. 58–63.

MDEQ, 2012, Montana Numeric Water Quality Standards: Montana Department of Environmental Quality Circular DEQ-7, 76 p.

Rye, R.O., and Truesdell, A.H., 1993, The question of recharge to the geysers and hot springs of Yel-

lowstone National Park: U.S. Geological Survey Open-File Report 93-384, 40 p.

Sorey, M.L., 1991, Effects of potential geothermal development in the Corwin Springs Known Geothermal Resources Area, Montana, on the thermal features of Yellowstone National Park: U.S. Geological Survey Water-Resources Investigations Report 91-4052.

Stotelmeyer, R.B., Johnson, D.S., and others, 1983, Economic appraisal of the North Absaroka Wilderness Study Area, *in* U.S. Geological Survey and U.S. Bureau of Mines, Mineral resources of the North Absaroka Wilderness Study Area, Park and Sweet Grass Counties, Montana: U.S. Geological Survey Bulletin 1505, 251 p.

U.S. Geological Survey, 1993, Mineral resource assessment of the Absaroka–Beartooth study area, Custer and Gallatin National Forests, Montana, Jane M. Hammarstrom, Michael L. Zientek, and James E. Elliot, eds: U.S. Geological Survey Open-File Report 93-207, 298 p.

Van Gosen, B.S., Elliott, J.E., LaRock, E.J., du Bray, E.A., Carlson, R.R., and Zientek, M.L., 1993, Generalized geologic map of the Absaroka–Beartooth Study Area, south-central Montana: U.S. Geological Survey Open-File Report 93-207, scale 1:126,720.

Zilka, N.T., 1983, Geothermal Resource, *in* Mineral resources of the north Absaroka Wilderness study area, Park and Sweet Grass Counties, Montana: U.S. Geological Survey Bulletin 1505, p. 241–244.

GREATERYELLOWSTONE.ORG
LOCATIONS IN MONTANA, IDAHO & WYOMING

HEADQUARTERS
215 South Wallace Avenue
Bozeman, Montana 59715
406.586.1593

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

July 24, 2016

Dear Chairman Murkowski and Ranking Member Cantwell:

Please accept the following 228-page report into the official record for the July 26, 2017 Senate Committee on Energy and Natural Resources hearing on the Yellowstone Gateway Protection Act, S.941. This report contains critical information regarding the threats to water quality posed by gold mining on the border of the world's first national park, Yellowstone.

> **Reference:** Kuipers, J.R., Maest, A.S. MacHardy, K.A., and Lawson, G. 2006. *Comparison of Predicted and Actual Water Quality at Hardrock Mines: the reliability of predictions in Environmental Impact Statements.* Available at: www.earthworksaction.org

This study reviews the history and accuracy of water quality predictions in Environmental Impact Statements (EISs) for major hard rock mines in the United States. Twenty-five case studies were analyzed including Mineral Hill which operated from 1989 to 1996 on private land in Jardine, Montana in the Crevasse Mining District. Mining operations ceased before the originally anticipated life-of-mine due to unexpected water interactions. The public lands surrounding this site is currently within the withdrawal perimeter proposed by S.941.

Mineral Hill (Section 6.3.15) was predicted to have "no impacts to groundwater and surface water." However, the 2001 EIS for reclamation and closure found, "modern mining operations impacted the historic flow from the mine, which was less than a few gallons a minute (gpm), resulting in an increased flow of approximately 15 gpm with arsenic concentrations in excess of standards (page 138)." The hydrologic prediction they would not encounter water in the underground workings was not accurate. To this day, those mine workings with the potential for excess levels of arsenic continue to flow into Bear Creek, then a short distance directly into Yellowstone National Park and ultimately, the Yellowstone River.

It is shown throughout this region that mining will encounter significant interactions with water. The passage of S.941 will help protect this life-blood of our recreation and agricultural economy by preventing additional large-scale exposures to sulfide-bearing ores that directly threaten Yellowstone National Park and the Yellowstone River.

Respectfully Submitted,

Joe Josephson
Montana Conservation Associate
Greater Yellowstone Coalition

Comparison of Predicted and Actual Water Quality at Hardrock Mines

The reliability of predictions in Environmental Impact Statements

Buka Environmental

Kuipers & Associates

Comparison of Predicted and Actual Water Quality at Hardrock Mines

The reliability of predictions in Environmental Impact Statements

James R. Kuipers
Kuipers & Associates
Butte, Montana

Ann S. Maest
Buka Environmental
Boulder, Colorado

Contributing Authors:

Kimberley A. MacHardy
Kuipers & Associates
Butte, Montana

Gregory Lawson
Buka Environmental
Boulder, Colorado

Copyright © 2006 by Kuipers & Associates and Buka Environmental.
All Rights Reserved.

Excerpts from this book may be reproduced for non-commercial purposes without permission provided full acknowledgement is given to the authors as follows:

Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. *Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.*

Copies of this publication may be obtained from:

Kuipers & Associates
PO Box 641, Butte, MT USA 59703
406.782.3441
jkuipers@kuipersassoc.com
www.kuipersassoc.com

Buka Environmental
729 Walnut Street, Suite D5, Boulder, CO, 80302 USA
303.449.0390
amaest@aol.com

EARTHWORKS
1612 K St., NW, Suite 808, Washington, DC, 20006 USA
202.887.1872
info@earthworksaction.org
www.mineralpolicy.org/earthworks_at_home.cfm

Photo credits
Front Cover: Left- Tailings impoundment at the Greens Creek Mine in Alaska USA (Courtesy of David Chambers). Center – Heap leach pad at Marigold Mine in Nevada (Ann Maest). Right – Waste rock dump and open pit at Beal Mountain Mine in Montana (Jim Kuipers). Back cover: Open pit at the Golden Sunlight Mine, Montana (Courtesy of Jeff Barber).

This publication was made possible by EARTHWORKS in Washington, DC, USA with the support of the Wilburforce Foundation of Seattle, Washington, USA. EARTHWORKS is a non-profit organization dedicated to protecting communities and the environment from the destructive impacts of mineral development in the U.S. and worldwide. The organization's mission is to work with communities and grassroots groups to reform government policies, improve corporate practices, influence investment decisions and encourage responsible materials sourcing and consumption.

Printed on Recycled Paper

PREFACE

The overall purpose of this study is to examine the reliability of pre-mining water quality predictions at hard rock mining operations in the United States. To our knowledge, no effort has previously been made to systematically compare predicted and actual water quality for mines in the U.S. or elsewhere. Environmental Impact Statements (EISs) and similar documents under federal and state law are the single publicly available source of water quality predictions for hard rock mines, and thus they were chosen as the information foundation for conducting the research. In designing the project, we decided to look broadly at as many mines as possible rather than concentrate on an in-depth analysis of a few mines. This approach – which shows general trends and can more easily be extrapolated to the larger set of hard rock mines – will provide the most useful results for mine regulators, which are the principal intended audience for the study. More in-depth studies of individual mines would be a natural next step for continuing investigations.

As part of the study, requests were made to federal and state agencies to provide National Environmental Policy Act (NEPA) documents and information on operational water quality. The effort required to obtain the documents and information, although initially expected to be onerous, was more arduous and protracted than we imagined. We were surprised to find that no single repository exists for NEPA documents, although the Environmental Protection Agency does have most EISs on microfiche. Technical reports associated with EISs were extremely difficult to obtain. Similarly, the availability of operational water quality information was uneven, ranging from disorganized paper-only copies in some states to user-friendly electronic information in others. The authors are grateful to the many agencies that did provide documents and water quality data. One of the most important recommendations in the report is that operational water quality data should be made available to the public in a transparent and easily accessible manner.

The report finds that adverse impacts to water quality are common at mine sites, and they are most often caused by failed mitigation. We recommend that a more in-depth study of the effectiveness of common mitigation measures be undertaken. Another important cause of water quality impacts is errors in geochemical and hydrologic characterization of the mined materials and the mine site area. The companion report (*Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State- of-the-Art)* makes a number of concrete suggestions for improving characterization and predictions.

This report also identifies inherent risk factors that may lead to water quality impacts. Although all mines require carefully executed mitigation measures, mines close to water resources with high acid drainage or contaminant leaching potential need special attention in terms of mitigation and characterization. Adopting protective mitigation and characterization approaches, as recommended here and in the companion report, will help prevent unacceptable water quality impacts, decrease long-term costs, and help instill public trust in the industry. This report is ultimately intended to advance the practice of science, engineering and regulation related to water quality prediction, the recognition of risk, and the application of effective mitigation to hardrock mines. The authors encourage ongoing cooperative efforts with regulators, scientists and engineers, non-governmental organizations, and industry to further the work begun in this study.

Jim Kuipers
Butte, Montana
and
Ann Maest
Boulder, Colorado
September 2006

AUTHORS

Jim (James R.) Kuipers, P.E., of Kuipers & Associates, is a mining engineer with over 20 years of experience in mine permitting, design, construction, operations, reclamation, water treatment and cost estimation. He has extensive experience in the gold and copper mining industries and has worked in the U.S., Canada, Latin America and former USSR. Since 1996 he has focused his work on providing expertise in mine permitting and reclamation and closure issues in addition to publishing articles and giving presentations on financial assurance. Over the course of his career he has had gained extensive knowledge in the various methods and models used to predict water quality at both existing and proposed mine sites as well as their regulatory applications. Mr. Kuipers holds a BS degree in mineral process engineering from Montana College of Mineral Science and Technology and is a registered professional engineer in Colorado and Montana.

Ann S. Maest, PhD, of Buka Environmental, is an aqueous geochemist specializing in the fate and transport of contaminants in natural waters. As a consultant, she has designed, conducted, and managed hydrogeochemistry and modeling studies and worked on independent monitoring and community capacity building projects at numerous mining sites in the U.S. and Latin America. At the U.S. Geological Survey, she conducted research on metal and metalloid speciation in surface water and groundwater. Dr. Maest has published articles on the fate and transport of metals in natural waters and served on national and international committees related to hardrock mining and sustainable development. She holds a PhD in geochemistry and water resources from Princeton University and an undergraduate degree in geology from Boston University.

Kimberley A. MacHardy, Associate Geoscientist with Kuipers & Associates, has a Master's Degree in Geosciences from Montana Tech of The University of Montana. Ms. MacHardy has worked on mine sites in Montana, and mine impacted sites in Nevada, prepared sampling and analysis plans, and coordinated, conducted, and directed field sampling programs. She has worked for two years on the Good Neighbor Agreement for the Stillwater Mine in Montana, where she conducted monthly sampling for water quality parameters and river flows on the Stillwater River, as well as periodic macroinvertebrate and nutrient sampling on both the Stillwater and East Boulder Rivers in Montana.

Gregory Lawson, Associate Geologist with Buka Environmental, has an undergraduate degree in geology from Oberlin College. Mr. Lawson has conducted field work in Japan and the Dominican Republic and has taken course work in chemistry, mineralogy, hydrology, and environmental geology. Mr. Lawson is currently pursuing a PhD in geology at the University of California at Riverside.

ACKNOWLEDGMENTS

Project advice, input and internal peer review were provided by Tom Myers, PhD, hydrogeologist, Dave Chambers, PhD, Center for Science in Public Participation and Glenn Miller, PhD, biochemist, of the University of Nevada-Reno. Technical review and editing was performed by Peggy Utesch and Sarah Zuzulock.

Various versions of the database, report and sections of the report were sent to state and federal regulators and industry consultants for review and comment. Because of the nature of this report, with many site specific examples, it was difficult to obtain peer review for every example and for the report as a whole. Reviewers included regulators from EPA, BLM and the Forest Service as well as industry consultants, and included Stephen Hoffman and Patricia McGrath of the EPA; and Jack Mozingo (Black & Veatch) and Andrew Robertson (Robertson Geoconsultants). The authors take sole responsibility for the contents of the report and will consider additional review comments for future publication or additional efforts derived from this report.

The involvement of all the reviewers lead to substantial improvements to this report and are greatly appreciated

CONTENTS

PREFACE i
AUTHORS ii
ACKNOWLEDGMENTS ii
CONTENTS iii
LIST OF ACRONYMS x
EXECUTIVE SUMMARY ES-1
1. INTRODUCTION 1
1.1. METHODOLOGY AND APPROACH 1
2. NEPA AND WATER QUALITY PREDICTIONS 3
2.1. NATIONAL ENVIRONMENTAL PROTECTION ACT 3
2.2. SCIENTIFIC ANALYSIS IN THE NEPA PROCESS 3
3. THE SCIENCE OF WATER QUALITY PREDICTION AND MITIGATION 5
3.1. SITE CONCEPTUAL MODEL 5
3.2. GEOCHEMICAL CHARACTERIZATION 5
3.3. WATER QUALITY MODELING 6
4. IDENTIFICATION OF MAJOR MINES SUBJECT TO NEPA 8
4.1. MAJOR MINES 8
4.1.1. METHOD AND APPROACH 8
4.1.2. LOCATION 13
4.1.3. COMMODITY 15
4.1.4. EXTRACTION AND PROCESSING METHODS 15
4.1.5. OPERATIONAL STATUS 15
4.1.6. DISTURBANCE AND FINANCIAL ASSURANCE 16
4.1.7. NPDES INFORMATION 16
4.2. MAJOR MINES WITH NEPA EIS ANALYSIS 16
4.2.1. LOCATION 17
4.2.2. COMMODITY 17
4.2.3. EXTRACTION AND PROCESSING METHODS 18
4.2.4. OPERATIONAL STATUS 19
4.3. COLLECTION OF EISS FOR MINES SUBJECT TO NEPA 19
4.3.1. LOCATION 19
4.3.2. COMMODITY 20
4.3.3. EXTRACTION AND PROCESSING METHODS 21
4.3.4. OPERATIONAL STATUS 21
4.3.5. NPDES INFORMATION 21
4.4. COMPARISON OF MINE INFORMATION 21
5. WATER QUALITY PREDICTIONS INFORMATION 23
5.1. SUMMARY OF RESULTS 23
5.2. GEOLOGY AND MINERALIZATION 27
5.3. CLIMATE 31
5.4. HYDROLOGY 35
5.4.1. SURFACE WATER PROXIMITY 35
5.4.2. DEPTH TO GROUNDWATER 37
5.5. GEOCHEMICAL CHARACTERIZATION AND MODELING 39
5.5.1. TESTING METHODS 39

5.5.2. CONSTITUENTS OF CONCERN IDENTIFIED ... 43
5.5.3. PREDICTIVE MODELS USED ... 44
5.6. WATER QUALITY IMPACT POTENTIAL ... 46
5.6.1. ACID DRAINAGE POTENTIAL ... 46
5.6.2. CONTAMINANT LEACHING POTENTIAL ... 49
5.6.3. POTENTIAL GROUNDWATER QUALITY IMPACTS ... 52
5.6.4. POTENTIAL SURFACE WATER QUALITY IMPACTS ... 54
5.6.5. POTENTIAL PIT WATER IMPACTS ... 57
5.7. PROPOSED MITIGATION ... 60
5.7.1. PROPOSED GROUNDWATER MITIGATION ... 60
5.7.2. PROPOSED SURFACE WATER MITIGATION ... 62
5.7.3. PROPOSED PIT WATER MITIGATION ... 64
5.7.4. PROPOSED WATER TREATMENT ... 66
5.8. PREDICTED WATER QUALITY IMPACTS ... 68
5.8.1. PREDICTED GROUNDWATER QUALITY IMPACTS ... 69
5.8.2. PREDICTED SURFACE WATER IMPACTS ... 72
5.8.3. PREDICTED PIT WATER IMPACTS ... 75
5.9. DISCHARGE INFORMATION ... 78
5.10. GENERAL RELATIONSHIPS AMONG ENVIRONMENTAL CHARACTERISTICS IN THE NEPA DOCUMENTS ... 80
5.10.1. GEOCHEMICAL CHARACTERISTICS: GEOLOGY/MINERALIZATION, ACID DRAINAGE POTENTIAL, AND CONTAMINANT LEACHING POTENTIAL ... 80
5.10.2. HYDROLOGIC AND CLIMATIC CHARACTERISTICS ... 81
5.10.3. COMBINATIONS OF GEOCHEMICAL AND HYDROLOGIC CHARACTERISTICS AND RELATIONSHIP TO POTENTIAL AND PREDICTED WATER QUALITY IMPACTS 83
5.10.4. CONCLUSIONS ... 85
6. WATER QUALITY PREDICTIONS AND IMPACTS AT NEPA MINES ... 87
6.1. METHODS AND APPROACH ... 87
6.2. GENERAL AND ENVIRONMENTAL CHARACTERISTICS OF CASE STUDY MINES 88
6.2.1. GENERAL CHARACTERISTICS OF CASE STUDY MINES ... 88
6.2.2. ENVIRONMENTAL INFORMATION RELATED TO WATER QUALITY ... 92
6.3. PREDICTED AND ACTUAL WATER QUALITY AT THE CASE STUDY MINES ... 97
6.3.1. GREENS CREEK, ALASKA ... 97
6.3.1.1. WATER QUALITY PREDICTIONS SUMMARY ... 97
6.3.1.2. ACTUAL WATER QUALITY CONDITIONS ... 98
6.3.1.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY ... 98
6.3.2. BAGDAD, ARIZONA ... 100
6.3.2.1. WATER QUALITY PREDICTIONS SUMMARY ... 100
6.3.2.2. ACTUAL WATER QUALITY CONDITIONS ... 100
6.3.2.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY ... 101
6.3.3. RAY MINE,ARIZONA ... 102
6.3.3.1. WATER QUALITY PREDICTIONS SUMMARY ... 102
6.3.3.2. ACTUAL WATER QUALITY CONDITIONS ... 102
6.3.3.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY ... 104
6.3.4. AMERICAN GIRL, CALIFORNIA ... 104
6.3.4.1. WATER QUALITY PREDICTIONS SUMMARY ... 104
6.3.4.2. ACTUAL WATER QUALITY CONDITIONS ... 106
6.3.4.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY ... 106

6.3.5. CASTLE MOUNTAIN, CALIFORNIA 107
6.3.5.1. WATER QUALITY PREDICTIONS SUMMARY 107
6.3.5.2. ACTUAL WATER QUALITY CONDITIONS 108
6.3.5.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 108
6.3.6. JAMESTOWN, CALIFORNIA 108
6.3.6.1. WATER QUALITY SUMMARY 108
6.3.6.2. ACTUAL WATER QUALITY CONDITIONS 110
6.3.6.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 110
6.3.7. MCLAUGHLIN, CALIFORNIA 112
6.3.7.1. WATER QUALITY PREDICTIONS SUMMARY 112
6.3.7.2. ACTUAL WATER QUALITY CONDITIONS 113
6.3.7.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 114
6.3.8. MESQUITE, CALIFORNIA 115
6.3.8.1. WATER QUALITY PREDICTIONS SUMMARY 115
6.3.8.2. ACTUAL WATER QUALITY CONDITIONS 117
6.3.8.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 117
6.3.9. ROYAL MOUNTAIN KING, CALIFORNIA 118
6.3.9.1. WATER QUALITY PREDICTIONS SUMMARY 118
6.3.9.2. ACTUAL WATER QUALITY CONDITIONS 119
6.3.9.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 120
6.3.10. GROUSE CREEK, IDAHO 122
6.3.10.1. WATER QUALITY PREDICTIONS SUMMARY 122
6.3.10.2. ACTUAL WATER QUALITY CONDITIONS 122
6.3.10.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 123
6.3.11. THOMPSON CREEK, IDAHO 124
6.3.11.1. WATER QUALITY PREDICTIONS SUMMARY 124
6.3.11.2. ACTUAL WATER QUALITY CONDITIONS 126
6.3.11.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 126
6.3.12. BEAL MOUNTAIN, MONTANA 127
6.3.12.1. WATER QUALITY PREDICTIONS SUMMARY 127
6.3.12.2. ACTUAL WATER QUALITY CONDITIONS 129
6.3.12.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 130
6.3.13. BLACK PINE, MONTANA 131
6.3.13.1. WATER QUALITY PREDICTIONS SUMMARY 131
6.3.13.2. ACTUAL WATER QUALITY CONDITIONS 132
6.3.13.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 133
6.3.14. GOLDEN SUNLIGHT, MONTANA 134
6.3.14.1. WATER QUALITY PREDICTIONS SUMMARY 134
6.3.14.2. ACTUAL WATER QUALITY CONDITIONS 136
6.3.14.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 136
6.3.15. MINERAL HILL, MONTANA 139
6.3.15.1. WATER QUALITY PREDICTIONS SUMMARY 139
6.3.15.2. ACTUAL WATER QUALITY CONDITIONS 140
6.3.15.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 140
6.3.16. STILLWATER, MONTANA 141
6.3.16.1. WATER QUALITY PREDICTIONS SUMMARY 141
6.3.16.2. ACTUAL WATER QUALITY CONDITIONS 142
6.3.16.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 142

6.3.17. ZORTMAN AND LANDUSKY, MONTANA 144
6.3.17.1. WATER QUALITY PREDICTIONS SUMMARY 144
6.3.17.2. ACTUAL WATER QUALITY CONDITIONS 146
6.3.17.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 147
6.3.18. FLORIDA CANYON, NEVADA 148
6.3.18.1. WATER QUALITY PREDICTIONS SUMMARY 148
6.3.18.2. ACTUAL WATER QUALITY CONDITIONS 149
6.3.18.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 149
6.3.19. JERRITT CANYON, NEVADA 150
6.3.19.1. WATER QUALITY PREDICTIONS SUMMARY 150
6.3.19.2. ACTUAL WATER QUALITY CONDITIONS 151
6.3.19.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 152
6.3.20. LONE TREE, NEVADA 153
6.3.20.1. WATER QUALITY PREDICTIONS SUMMARY 153
6.3.20.2. ACTUAL WATER QUALITY CONDITIONS 154
6.3.20.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 154
6.3.21. ROCHESTER, NEVADA 155
6.3.21.1. WATER QUALITY PREDICTIONS SUMMARY 155
6.3.21.2. ACTUAL WATER QUALITY CONDITIONS 156
6.3.21.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 157
6.3.22. ROUND MOUNTAIN, NEVADA 158
6.3.22.1. WATER QUALITY PREDICTIONS SUMMARY 158
6.3.22.2. ACTUAL WATER QUALITY CONDITIONS 159
6.3.22.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 159
6.3.23. RUBY HILL, NEVADA 160
6.3.23.1. WATER QUALITY PREDICTIONS SUMMARY 160
6.3.23.2. ACTUAL WATER QUALITY CONDITIONS 161
6.3.23.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 161
6.3.24. TWIN CREEKS, NEVADA 161
6.3.24.1. WATER QUALITY PREDICTIONS SUMMARY 162
6.3.24.2. ACTUAL WATER QUALITY CONDITIONS 163
6.3.24.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 163
6.3.25. FLAMBEAU, WISCONSIN 165
6.3.25.1. WATER QUALITY PREDICTIONS SUMMARY 165
6.3.25.2. ACTUAL WATER QUALITY CONDITIONS 166
6.3.25.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY 166
7. SUMMARY OF CASE STUDY FINDINGS AND INHERENT FACTORS AFFECTING OPERATIONAL WATER QUALITY 168
7.1. ACCURACY OF WATER QUALITY PREDICTIONS: SUMMARY OF CASE STUDY FINDINGS 168
7.1.1. ACID DRAINAGE/CONTAMINANT LEACHING POTENTIAL AND DEVELOPMENT 168
7.1.2. PREDICTED AND ACTUAL IMPACTS TO SURFACE WATER RESOURCES 171
7.1.3. PREDICTED AND ACTUAL IMPACTS TO GROUNDWATER RESOURCES 173
7.2. INHERENT FACTORS AFFECTING WATER QUALITY AT CASE STUDY MINES 175
7.2.1. MINES WITH CLOSE PROXIMITY TO SURFACE WATER AND MODERATE TO HIGH ACID DRAINAGE OR CONTAMINANT LEACHING POTENTIAL 176

7.2.2. MINES WITH SHALLOW DEPTH OR DISCHARGES TO GROUNDWATER AND WITH MODERATE TO HIGH ACID DRAINAGE OR CONTAMINANT LEACHING POTENTIAL 179
7.3. SUMMARY AND CONCLUSIONS 184
8. FAILURE MODES AND ROOT CAUSES OF WATER QUALITY IMPACTS 185
8.1. METHODOLOGY AND APPROACH 185
8.1.1. FAILURE MODES AND ROOT CAUSES 185
8.2. EXAMPLES OF CHARACTERIZATION FAILURES FROM CASE STUDY MINES 186
8.2.1. HYDROLOGIC CHARACTERIZATION FAILURES 186
8.2.2. GEOCHEMICAL CHARACTERIZATION FAILURES 187
8.3. MITIGATION FAILURES 189
8.4. SUMMARY OF RESULTS 192
8.5. CONCLUSIONS AND RECOMMENDATIONS 193
9. REFERENCES 195

Appendix A – Major Mine Statistical Information (available electronically only)
Appendix B - Case Study Detailed Information (available electronically only)

LIST OF FIGURES

Figure 3.1 A mine site conceptual model with pathways and opportunities for hydrologic and geochemical modeling 7

LIST OF TABLES

Table ES-1. Comparison of General Categories for All Hard Rock Mines, NEPA-eligible Mines and Mines with Reviewed EISs (% of mines in sub-category) ES-4
Table ES-2. Case Study Mines ES-5
Table ES-3. Comparison of General Categories for All Mines with Reviewed EISs and Case Study Mines (% of mines in subcategory) ES-6
Table ES-4. Comparison of EIS Elements for All Mines with Reviewed EISs and Case Study Mines (% of mines with sub-element) ES-7
Table ES-5. Summary of Predicted and Actual Impacts to Surface Water Resources at Case Study Mines ES-9
Table ES-6. Summary of Predicted and Actual Impacts to Groundwater Resources at Case Study Mines ES-9
Table ES-7a. Summary of Acid Drainage Potential Predictions and Results for Case Study Mines ES-9
Table ES-7b. Summary of Contaminant Leaching Potential Predictions and Results for Case Study Mines (percentages) ES-10
Table ES-8. Surface Water Quality Impacts for Mines with Close Proximity to Surface Water and Elevated Acid Drainage Potential Compared to Surface Water Impacts for All Case Study Mines ES-11
Table ES-9. Groundwater Quality Impacts for Mines with Close Proximity to Groundwater and Elevated Acid Drainage Potential Compared to Groundwater Impacts for All Case Study Mines ES-12
Table ES-10. Water Quality Predictions Failure Modes, Root Causes and Examples from Case Study Mines ES-14
Table ES-11. Summary of Failure Modes for Case Study Mines ES-14
Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present 9
Table 4.2. General Information for Major Hardrock Mines 14
Table 4.3. General Information for Major Mines Subject to NEPA 18
Table 4.4. General Information for Mines with Reviewed EISs 20
Table 4.5. Comparison of Major Mines, Mines Subject to NEPA and Major Mines Subject to NEPA with EIS Reviewed in Detail 22

Table 5.1. Mineralization Types, Examples, and Associated Rock Types 28
Table 5.2. Rock Types and Names and Associated Relative Neutralizing and Acid-Generating Potential 29
Table 5.3. Mineral/Ore Associations 30
Table 5.4. Köppen Climate Classification 34
Table 5.5. Surface Water Proximity 36
Table 5.6. Depth to Groundwater 38
Table 5.7. Geochemical Characterization 40
Table 5.8. Identified Constituents of Concern 44
Table 5.9. Predictive Models Used 45
Table 5.10. Acid Drainage Potential 47
Table 5.11. Contaminant Leaching Potential 51
Table 5.12. Groundwater Quality Impact Potential 53
Table 5.13. Surface Water Quality Impact Potential 55
Table 5.14. Pit Water Quality Impact Potential 58
Table 5.15. Proposed Groundwater Mitigation 61
Table 5.16. Proposed Surface Water Mitigation 63
Table 5.17. Proposed Pit Water Mitigation 65
Table 5.18. Proposed Water Treatment 67
Table 5.19. Predicted Groundwater Quality Impacts 70
Table 5.20. Predicted Surface Water Quality Impacts 74
Table 5.21. Predicted Pit Water Quality Impacts 76
Table 5.22. Discharge Information 79
Table 5.23. Comparison of Surface Water and Groundwater Hydrology Classifications for the 71 NEPA Mines Reviewed in Detail 82
Table 5.24. Potential and Predicted Surface Water Quality Impacts for Mines with Moderate to High Acid Generation Potential and Close Proximity to Surface Water 83
Table 5.25. Potential and Predicted Groundwater Quality Impacts for Mines with Moderate to High Acid Drainage Potential and Close Proximity to Groundwater Resources 84
Table 5.26. Potential and Predicted Surface Water Quality Impacts for Mines with Moderate to High Contaminant Leaching Potential and Close Proximity to Surface Water Resources 85
Table 5.27. Potential and Predicted Groundwater Quality Impacts for Mines with Moderate to High Contaminant Leaching Potential and Close Proximity to Groundwater Resources 86
Table 6.1. Case Study Mines 88
Table 6.2. Mines Selected for In-Depth Study: General Mine Site Characteristics 89
Table 6.3. Comparison of General Categories for All Mines with Reviewed EISs and Case Study Mines (% of mines in subcategory) 91
Table 6.4. Comparison of EIS Elements for All Mines with Reviewed EISs and Case Study Mines (% of mines with sub-element) 92
Table 6.5. Water Quality Characterizations for Case Study Mines 93
Table 6.6. Greens Creek, AK, Potential, Predicted and Actual Impacts 99
Table 6.7. Bagdad, AZ, Potential, Predicted and Actual Impacts 102
Table 6.8. Ray, AZ, Potential, Predicted and Actual Impacts 104
Table 6.9. American Girl, CA, Potential, Predicted and Actual Impacts 106
Table 6.10. Castle Mountain, CA, Potential, Predicted and Actual Impacts 108
Table 6.11. Jamestown, CA, Potential, Predicted and Actual Impacts 111
Table 6.12. McLaughlin, CA, Potential, Predicted and Actual Impacts 114
Table 6.13. Mesquite, CA, Potential, Predicted and Actual Impacts 117
Table 6.14. Royal Mountain King, CA, Potential, Predicted and Actual Impacts 121
Table 6.15. Grouse Creek, ID, Potential, Predicted and Actual Impacts 123
Table 6.16. Thompson Creek, ID, Potential, Predicted and Actual Impacts 127
Table 6.17. Beal Mountain, MT, Potential, Predicted and Actual Impacts 131
Table 6.18. Black Pine, MT, Potential, Predicted and Actual Impacts 133

Table 6.19. Golden Sunlight, MT, Potential, Predicted and Actual Impacts 137
Table 6.20. Mineral Hill, MT, Potential, Predicted and Actual Impacts 140
Table 6.21. Stillwater MT, Potential, Predicted and Actual Impacts 143
Table 6.22. Zortman and Landusky, MT, Potential, Predicted and Actual Impacts 147
Table 6.23. Florida Canyon, NV, Potential, Predicted and Actual Impacts 149
Table 6.24. Jerritt Canyon, NV, Potential, Predicted and Actual Impacts 152
Table 6.25. Lone Tree, NV, Potential, Predicted and Actual Impacts 155
Table 6.26. Rochester, NV, Potential, Predicted and Actual Impacts 157
Table 6.27. Round Mountain, NV: Potential, Predicted and Actual Impacts 160
Table 6.28. Ruby Hill, NV, Potential, Predicted and Actual Impacts 161
Table 6.29. Twin Creeks, NV, Potential, Predicted and Actual Impacts 164
Table 6.30. Flambeau, WI, Potential, Predicted and Actual Impacts 167
Table 7.1. EIS and Operational Water Quality Information for Case Study Mines 170
Table 7.2. Acid Drainage Potential Predictions and Results for Case Study Mines (Percentages) 171
Table 7.3. Contaminant Leaching Potential Predictions and Results for Case Study Mines (Percentages) 171
Table 7.4. Predicted and Actual Impacts and Proximity to Surface Water Resources at Case Study Mines 172
Table 7.5. Predicted and Actual Impacts to Surface Water Resources at Case Study Mines (Percentages) 173
Table 7.6. Predicted and Actual Impacts and Proximity to Groundwater Resources at Case Study Mines 174
Table 7.7. Predicted and Actual Impacts to Groundwater Resources at Case Study Mines (Percentages) 175
Table 7.8. Surface Water Quality Impacts for Mines with Close Proximity to Surface Water and Elevated Acid Drainage Potential Compared to Surface Water Impacts for All Case Study Mines 179
Table 7.9. Groundwater Quality Impacts for Mines with Close Proximity to Groundwater and Elevated Acid Drainage Potential Compared to Groundwater Impacts for All Case Study Mines 183
Table 8.1. Water Quality Predictions Failure Modes, Root Causes and Examples from Case Study Mines 186
Table 8.2. Summary of Failure Modes for Case Study Mines 192

LIST OF ACRONYMS

ABA	Acid Base Accounting
ACE	Army Corp of Engineers
ADEQ	Arizona Department of Environmental Quality
Ag	Silver
AGP	Acid Generating Potential
Al	Aluminum
ANP	Acid Neutralizing Potential
APP	Arizona Aquifer Protection Permit
As	Arsenic
B	Boron
BADCT	Best Available Demonstrated Control Technology
Be	Beryllium
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
Ca	Calcium
CA WET	California Waste Extraction Test
Cd	Cadmium
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Cl	Chloride
CN	Cyanide
COE	Army Corp of Engineers
Cr	Chromium
Cu	Copper
DI	Deionized Water
DL-SX	Dump Leach Solvent Extraction
EA	Environmental Assessment
EA/EIR	Environmental Assessment /Environmental Impact Report
ECHO	EPA's Enforcement History and Online Database
EECA	Engineering Evaluation /Cost Analysis
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EIS/EIR	Environmental Impact Statement /Environmental Impact Report
EPA	Environmental Protection Agency
EP Toxicity	Extraction Procedure Toxicity Test
F	Flotation
F	Fluoride
Fe	Iron
FG	Flotation and Gravity
FOIA	Freedom of Information Act
FONSI	Finding of No Significant Impact
Ft	Feet
gpm	gallons per minute
g/l	grams per liter
Hg	Mercury

HL	Heap Leach
HCT	Humidity Cell Tests
LAD	Land Application Discharge
MAS/MILS	Mineral Availability System /Mineral Industry Locater System
MCL/SMCL	Maximum Contaminant Level/Secondary Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality
mg/l	milligrams per liter
µg/l	micrograms per liter
msl	mean sea level
MEP	Multiple Extraction Procedure
MEPA	Montana Environmental Protection Act
Mg	Magnesium
Mn	Manganese
MWMP	Metric Water Mobility Procedure
N	Nitrogen
NAG	Net Acid Generating
NCV	Net Carbonate Value
NDEP	Nevada Department of Environmental Protection
NEPA	National Environmental Policy Act
NGOs	Non-Governmental Organizations
NH_4	Ammonia
Ni	Nickel
NNP	Net Neutralizing Potential
NO_3	Nitrate
NP	Neutralizing Potential
NP/AP	Neutralizing Potential/Acid Potential
NPDES	National Pollution Discharge Elimination System
OP	Open Pit
P	Phosphorous
PAG	Potentially Acid-Generating
Pb	Lead
PER	Preliminary Environmental Review
PLS	Pregnant Leach Solution
PGM	Platinum Group Minerals
ppm	parts per million
ROD	Record of Decision
RWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
S	Smelter
Sb	Antimony
SDWA	Safe Drinking Water Act
Se	Selenium
SEIS	Supplemental Environmental Impact Statement
SO_4	Sulfate
SPLP	Synthetic Precipitation Leaching Procedure
SSRE	Sequential Saturated Rolling Extraction
STLC	Soluble Threshold Limit Concentration
SWCB	State Water Control Board
SX/EW	Solvent Extraction Electrowinning
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
Tl	Thallium

t/kt	tons per kiloton
TTLC	Total Threshold Limit Concentrations
UG	Underground
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
VL	Vat Leach
WAD	Weak Acid Dissociable
WQ	Water Quality
Zn	Zinc

EXECUTIVE SUMMARY

INTRODUCTION AND APPROACH

This study reviews the history and accuracy of water quality predictions in Environmental Impact Statements (EISs) for major hardrock mines in the United States. It does so by:

- identifying major hardrock metals mines in the United States and determining which major mines had EISs
- gathering and evaluating water quality prediction information from EISs
- selecting a representative subset of mines with EISs for in-depth study
- examining actual water quality information for the case study mines, and
- comparing actual water quality to the predictions made in EISs.

Based on the results of the evaluations conducted, an analysis was performed to identify the most common causes of water quality impact and prediction failures. In addition, an analysis was conducted to determine if there were inherent risk factors at mines that may predispose an operation to having water quality problems. Conclusions are provided about the effectiveness of the underlying scientific and engineering principles used to make water quality predictions in EISs. Finally, recommendations are made for regulatory, scientific and engineering approaches that would improve the reliability of water quality predictions at hardrock mine sites.

The National Environmental Policy Act (NEPA), enacted in 1969, was the first environmental statute in the United States and forms the foundation of a comprehensive national policy for environmental decision making. NEPA requires federal agencies to take a "hard look" at the environmental impacts of each proposed project to ensure the necessary mitigation or other measures are employed to meet federal and state regulations and other applicable requirements. Under NEPA, when a new mine is permitted, agencies have a duty to disclose underlying scientific data and rationale supporting the conclusions and assumptions in an EIS.

NEPA requires federal agencies proposing major actions that may substantially affect the quality of the human environment to prepare a detailed Environmental Impact Statement (EIS). A "major action" includes actions approved by permit or other regulatory action. If the agency finds that the project *may* have a significant impact on the environment, then it must prepare an EIS. As part of the EIS process, hardrock mines operating on federal lands or otherwise subject to NEPA are required to estimate impacts to the environment, including direct impacts to water quality and indirect impacts that occur later in time but are still reasonably foreseeable. The NEPA analysis process calls for performing original research, if necessary, and reasonable scientifically supported forecasting and speculation. A wide array of scientific approaches has been used to predict water quality that could result at mine sites, and many different engineering techniques were applied to mitigate these potential impacts. The primary subject of this report is the effectiveness of water quality predictions and mitigation that were applied over the past 30 years as a part of the EIS process at hardrock mines in the United States.

IDENTIFICATION OF MAJOR AND NEPA-ELIGIBLE HARD ROCK MINES

Major Hardrock Metal Mines in the United States

Hardrock metal mines in the United States produce gold, silver, copper, molybdenum, lead, zinc and platinum group metals from open pit and underground mining operations. For the purpose of this study, "major" mines were defined as: those that have a disturbance area of over 100 acres and a financial assurance amount of over $250,000; have a financial assurance of $1,000,000 alone (regardless of acreage); or have a production history (since 1975) of greater than 100,000 ounces of gold, 100,000,000 pounds of copper or the monetary value equivalent in another metal. Using those criteria, 183 major hardrock metal mines were identified as having operated since 1975.
The major hardrock mines are located in fourteen states (Alaska, Arizona, California, Colorado, Idaho, Michigan, Montana, Nevada, New Mexico, South Carolina, South Dakota, Utah, Washington and Wisconsin), with the vast

majority (178 of 183) located in western states. Nevada has the greatest number of major mines of any state, with 74 (40%) of the total major mines. Sixty-three percent (63%) of the mines produce gold and/or silver, 16% produce copper, 4% produce copper and molybdenum, 2% produce molybdenum only, 4% produce lead and zinc, and 1% produce platinum group metals (percentages add to greater than 100 because some mines produce multiple commodities).

Seventy-two percent (72%) of the major hardrock mines in the U.S. that have operated since 1975 are open pit mines, while 15% are underground. Sixty-six percent (66%) of the major hardrock mines use cyanide heap or vat leaching, 24% use flotation or gravity processing and 12% process ore by acid dump leaching and solvent extraction/ electrowinning.

Forty-five percent (45%) of the 183 major hardrock mines in operation since 1975 are still operating, and 49% have closed. Only one new major hardrock mine is currently (as of 2005) in construction, and seven others are in various stages of permitting. After the NEPA processes were completed, development proposals were withdrawn for four of the major hardrock mines identified in this study.

Major Hardrock Metal Mines Subject to NEPA

Mines located on federal land administered by the Bureau of Land Management or the Forest Service are subject to the requirements of NEPA. Also subject to NEPA regulations are certain National Pollution Discharge Elimination System (NPDES) permits issued by the Environmental Protection Agency, certain 404 Wetlands permits from the Army Corp of Engineers, and mines located on Native American trust lands administered by the Bureau of Indian Affairs (BIA). In addition, some states (California, Montana, Washington and Wisconsin) have a state-mandated process that is equivalent to NEPA.

NEPA requires environmental analysis of federal actions. As it has evolved, an EIS is required for any "major federal action significantly affecting the quality of the human environment," and an Environmental Assessment (EA) is required for lesser actions. EAs do not require public comment; the results of an EA can determine whether the action is significant, which will trigger an EIS, but usually the EA is performed in lieu of an EIS.

Of the 183 major modern-era hardrock mines identified, 137 (75%) had federal actions that triggered NEPA analysis. Ninety-three (68%) were located on BLM land, thirty-four (25%) on Forest Service land, and nine (7%) on both BLM and Forest Service land. Disturbance of wetlands triggered NEPA analysis at five (4%) of the mines, requiring a 404 wetlands permits from the Corp of Engineers (COE); a discharge into a water of the United States was the only NEPA trigger at three (2%) mines; and NEPA analysis was triggered at two (1%) mines because they were located on Indian Lands. Twenty-three (19%) mines were located in states that have their own NEPA-equivalent statutes. In many cases, more than one federal agency may be involved in the NEPA process (e.g., Forest Service and BLM, based on location, or Forest Service and EPA, based on location and a NPDES discharge); in addition, state agencies may be responsible for carrying out their own NEPA-equivalent or alternative processes. When this occurs, a Memorandum of Understanding (MOU) is usually written among the various agencies describing their shared responsibilities in order to avoid duplication of efforts. When two or more federal and/or state agencies are involved, the agencies establish a formal agreement delineating which will act in the lead and cooperating roles. In some cases an EIS (or EA) may be developed that will satisfy both NEPA and a NEPA-equivalent state law.

The general makeup of the mines where NEPA is applicable is roughly similar to that of major mines. The NEPA-applicable mines are located in 11 states with all but one located in the western states. Nevada had the most NEPA-applicable major mines with 50% (69) of the total. Eighty-five percent (116) of the NEPA-applicable mines produced gold and/or silver, while 15% (21) produced copper. Seventy-six percent (104) of the NEPA-applicable major mines were open-pit, while 14% (19) were underground mines. Sixty-nine percent (95) used cyanide heap or vat leach, 20% (28) used flotation/gravity and 11% (15) used acid dump leach processing. Forty-seven percent (64) of the major mines subject to NEPA were still operating, 45% (61) have closed, one was in construction, six were in permitting, and five were withdrawn from consideration after undergoing the NEPA process.

EISs were performed at 82 (60%) of the 137 major mines subject to NEPA, either as part of new permitting actions or later expansions or other actions. EAs were performed at the remainder of the mines subject to NEPA. EISs and EAs were obtained by writing, e-mailing, and/or calling state and federal agencies, including the BLM, Forest Service, tribal agencies and by conducting library searches. The process of obtaining NEPA documents took approximately 16 months and involved numerous follow-up calls, and written and email contact. Of the 137 major mines subject to NEPA, 71 mines had documents that were obtained and reviewed. A total of 104 NEPA documents, either EISs or EAs, were reviewed for the 71 mines. The general characteristics of mines with reviewed EISs are similar to those of all major hard rock mines and all NEPA-eligible mines, as shown in Table ES-1.

EVALUATION OF WATER QUALITY PREDICTION INFORMATION IN NEPA DOCUMENTS

Information on the following elements related to water quantity and quality predictions was collected from the 104 NEPA documents: geology/mineralization; climate; hydrology; field and laboratory tests performed; constituents of concern identified; predictive models used; water quality impact potential; mitigation; potential water quality impacts; predicted water quality impacts; and discharge information. There are two types of water quality predictions made in EISs: "potential" water quality, which leans toward worst-case water quality that does not take mitigation into account; and "predicted" water quality, which does consider the beneficial effects of mitigation. Both types of water quality predictions were recorded and used for subsequent comparisons to actual water quality. For each type of information collected from the NEPA documents, a score was derived to characterize the element (e.g., geology/ mineralization used six scores, including one for no information provided). The scoring allowed numeric summaries (percentages) to be calculated based on the information collected from the NEPA documents. The results for the EIS information collected for each mine reviewed in detail (71 mines, 104 EISs) are contained in Section 5 of the report. Limited information on certain water quality elements is contained in Table ES-4.

A preliminary evaluation of the availability of operational water quality information was performed before selection of the case study mines. Operational and post-operational water quality information was available from EISs conducted after the new project EIS, especially for the states of Alaska, Montana and Idaho, where multiple EISs were often available. In other states, such as Arizona, California, Nevada and Wisconsin, technical reports and water quality data were available from state agencies that regulate mining activities.

SELECTION OF CASE STUDY MINES

The case study mines were selected based on:

- the ease of access to information on operational water quality
- the variability in general categories such as geographic location, commodity type, extraction and processing methods, and
- the variability in EIS elements related to water quality, such as climate, proximity to groundwater and surface water resources, acid drainage potential and contaminant leaching potential.

Case studies were developed for the twenty-five mines listed in Table ES-2.

Table ES-1. Comparison of General Categories for All Hard Rock Mines, NEPA-eligible Mines and Mines with Reviewed EISs (% of mines in sub-category)

Category	Sub-category	Major Mines (%)	NEPA-eligible Mines (%)	Mines with Reviewed EISs (%)
Location	Alaska	4.4%	5.1%	9.9%
	Arizona	10.9%	9.5%	11.3%
	California	8.2%	9.5%	11.3%
	Colorado	4.9%	0.0%	0.0%
	Idaho	7.7%	4.4%	8.5%
	Michigan	0.5%	0.0%	0.0%
	Montana	8.2%	10.9%	18.3%
	Nevada	40.4%	50.4%	32.4%
	New Mexico	3.8%	2.2%	2.8%
	South Carolina	1.6%	0.0%	0.0%
	South Dakota	2.7%	0.7%	1.4%
	Utah	3.8%	2.9%	1.4%
	Washington	2.2%	2.9%	0.0%
	Wisconsin	0.5%	0.7%	1.4%
Commodity	Primary Gold	12.6%	12.4%	19.7%
	Primary Silver	7.1%	6.6%	7.0%
	Gold and Silver	62.8%	65.7%	54.9%
	Copper	16.4%	15.3%	19.7%
	Copper and Molybdenum	4.4%	2.9%	1.4%
	Molybdenum	2.2%	0.7%	1.4%
	Lead and Zinc	3.8%	3.6%	5.6%
	Platinum Group	1.1%	1.5%	2.8%
Extraction Methods	Underground	14.8%	13.9%	18.3%
	Open Pit	72.1%	75.9%	71.8%
	Underground + Open Pit	12.0%	10.2%	9.9%
Processing Methods	Heap or Vat Leach	65.6%	69.3%	62.0%
	Flotation and Gravity	24.0%	20.4%	26.8%
	Dump Leach (SX/EW)	12.0%	10.9%	11.3%
	Heap Leach	39.3%	38.7%	25.4%
	Vat Leach	9.3%	10.2%	14.1%
	Heap Leach and Vat Leach	16.9%	20.4%	22.5%
	Smelter	3.3%	1.5%	1.4%
Operational Status	Operating	44.8%	46.7%	49.3%
	Closed	48.6%	44.5%	36.6%
	In Construction	0.5%	0.7%	1.4%
	Permitting	3.8%	4.4%	7.0%
	Withdrawn	2.2%	3.6%	5.6%
Total number of mines in category		183	137	71

Table ES-2. Case Study Mines

Mine	State	Mine	State
Greens Creek	AK	Golden Sunlight	MT
Bagdad	AZ	Mineral Hill	MT
Ray	AZ	Stillwater	MT
American Girl	CA	Zortman and Landusky	MT
Castle Mountain	CA	Florida Canyon	NV
Jamestown	CA	Jerritt Canyon	NV
McLaughlin	CA	Lone Tree	NV
Mesquite	CA	Rochester	NV
Royal Mountain King	CA	Round Mountain	NV
Grouse Creek	ID	Ruby Hill	NV
Thompson Creek	ID	Twin Creeks	NV
Beal Mountain	MT	Flambeau	WI
Black Pine	MT		

The major characteristics of the case study mines were similar to those of all mines with reviewed EISs, as shown in Table ES-3. The availability of information on operational water quality was also a major factor in the selection of case-study mines. The highest percentage of case study mines was from Nevada, and this state had the highest percentage of mines for all major mines, NEPA-eligible mines, and mines with reviewed EISs. Somewhat higher percentages of mines from California and Montana were selected for case studies because of the ease of obtaining operational water quality information from these states. Similar percentages of gold and/or silver mines were selected for the case studies as were present in all mines with reviewed EISs. However, a lower percentage of primary copper mines was selected for case study because of the difficulty in obtaining operational water quality information on these facilities. Case study mines had very similar percentages as all mines with reviewed EISs in terms of extraction and processing methods. In terms of operational status, no case study mines were in construction, in permitting, or withdrawn because operational water quality information would not be available for mines in these types of operational status.

Case study mines were also similar to all mines with reviewed EISs in terms of EIS elements related to water quality, as shown in Table ES-4. The elements listed in Table ES-4 are considered "inherent" factors that may affect water quality conditions. That is, these elements are related to conditions that either relate to climatic and hydrologic conditions at and near the mine site (in the case of climate, and proximity to water resources) or to qualities of the mined materials that may affect water quality (in the case of acid drainage and contaminant leaching potential). For a number of mines, little or no information on these elements was available in initial EISs, but subsequent NEPA documents either contained the first information or contained improved information after water quality conditions developed at the mine site during and after operation. Therefore, for acid drainage and contaminant leaching potential, the highest documented potential in any of the EISs was recorded.

Case study mines were similar to all mines with reviewed EISs in terms of climate and proximity to surface water resources. When compared to all mines with reviewed EISs, a higher percentage of case study mines had shallower depths to groundwater. However, six of the case study mines had groundwater depths greater than 50 feet below the ground surface. In terms of acid drainage potential, lower percentages of case study mines had low and high acid drainage potential, but higher percentages had moderate acid drainage potential. Therefore, the case study mines provide a somewhat more evenly distributed range of acid drainage potentials than all mines with reviewed EISs. Case study mines had nearly identical percentages of mines with low and high contaminant leaching potential, but more case study mines had moderate acid drainage potential, reflecting fewer mines in the "no information" category for case study mines.

Table ES-3. Comparison of General Categories for All Mines with Reviewed EISs and Case Study Mines (% of mines in subcategory)

Category	Subcategory	All Mines with Reviewed EISs	Case Study Mines
Location	Alaska	10%	4%
	Arizona	11%	8%
	California	11%	24%
	Colorado	0%	0%
	Idaho	9%	8%
	Michigan	0%	0%
	Montana	18%	24%
	Nevada	32%	28%
	New Mexico	3%	0%
	South Carolina	0%	0%
	South Dakota	1%	0%
	Utah	1%	0%
	Washington	0%	0%
	Wisconsin	1%	4%
Commodity	Primary Gold	20%	12%
	Primary Silver	7%	4%
	Gold and Silver	55%	64%
	Copper	20%	4%
	Copper and Molybdenum	1%	4%
	Molybdenum	1%	4%
	Lead and Zinc	6%	4%
	Platinum Group	3%	4%
Extraction Methods	Underground	18%	16%
	Open Pit	72%	76%
	Underground + Open Pit	10%	8%
Processing Methods	Heap and/or Vat Leach	62%	72%
	Flotation and Gravity	27%	28%
	Dump Leach (SX/EW)	11%	8%
	Heap Leach	25%	20%
	Vat Leach	14%	16%
	Heap Leach and Vat Leach	23%	32%
	Smelter	1%	0%
Operational Status	Operating	49%	52%
	Closed	37%	48%
	In Construction	1%	0%
	Permitting	7%	0%
	Withdrawn	6%	0%
Total number of mines		71	25

Table ES-4. Comparison of EIS Elements for All Mines with Reviewed EISs and Case Study Mines (% of mines with sub-element)

Element	Sub-element	All Mines with Reviewed EISs	Case Study Mines
Climate	Dry/Arid	20%	20%
	Dry/Semi-Arid	35%	28%
	Humid Subtropical	4%	12%
	Marine West Coast	4%	4%
	Boreal Forest	28%	32%
	Continental	3%	4%
	Sub-Arctic	4%	0%
Surface Water Proximity	No information	7%	4%
	Perennial Streams >1 mile	26%	24%
	Perennial streams <1 mile	25%	28%
	Perennial streams on site	44%	44%
Groundwater Proximity	No information	12%	4%
	Groundwater >200 ft deep	16%	8%
	Groundwater 50-200 ft deep	13%	16%
	Groundwater 0-50 ft deep/springs on site	59%	72%
Acid Drainage Potential (highest)	No information	9%	8%
	Low	58%	48%
	Moderate	6%	32%
	High	27%	12%
Contaminant Leaching Potential (highest)	No information	22%	12%
	Low	32%	32%
	Moderate	30%	40%
	High	17%	16%
Total number of mines		71	25

Overall, the case study mines display a variability in geographic location, commodity type, extraction and processing methods and in EIS elements related to water quality. Considering the additional limitation of having readily accessible operational water quality information, the case study mines reflect well the distribution of general categories and water quality-related elements that are present in the larger subsets of hard rock mines in the United States.

Case studies for each mine contain information collected from EISs and other documents, information on actual water quality, a comparison of predicted and actual water quality, and an analysis of the causes of water quality impacts and prediction errors.

COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Operational and post-operational water quality information was collected from EISs conducted after the new project EIS for mines in Alaska, Montana and Idaho. Interviews of state agency personnel were conducted in California, Montana, Nevada and Wisconsin. Technical reports and water quality data from state agencies that regulate mining were collected for mines in Arizona, California, Nevada and Wisconsin. In some cases, the water quality data showed pre-mining and operational water quality, but baseline data were generally difficult to obtain. The information collected on actual water quality conditions was held in databases or in electronic and paper files for comparison to predicted water quality.

For this evaluation, a water quality impact is defined as increases in water quality parameters as a result of mining operations, whether or not an exceedence of water quality standards or permit levels has occurred. Information on whether groundwater, seep, or surface water concentrations exceeded standards as a result of mining activity is also included. Nearly all the EISs reviewed reported that they expected acceptable water quality (concentrations lower than relevant standards) after mitigation were taken into account. Indeed, if this prediction was not made in the EIS, the regulatory agency would not be able to approve the mine (with certain exceptions, such as pit water quality, in states where pit water is not considered a water of the state).

A comparison between potential (pre-mitigation), predicted, and actual surface water quality for the case study mines is presented in Table ES-5. Sixty percent of the case study mines (15/25) had mining-related exceedences in surface water. Of the mines with surface water quality exceedences, four (17%) noted a low potential, seven (47%) a moderate potential, two a high potential, and three had no information in their EISs for surface water quality impacts in the absence of mitigation measures. For the mines with surface water quality exceedences, only one mine, the McLaughlin Mine in California, was correct in predicting a moderate potential for surface water quality impacts with mitigation in place. However, this mine predicted low acid drainage potential, yet acid drainage has developed on site. Of the mines without surface water quality exceedences (7 or 28%), all were correct thus far in predicting no impacts to surface water with mitigation in place. Three of the seven are desert mines in California, one (Stillwater in Montana) has had increases in contaminant concentrations but no exceedences, and the other three have had no exceedences or increases in mining-related contaminant concentrations in surface water to date. Therefore, most case study mines predicted no impacts to surface water quality after mitigation are in place, but at the majority of these mines, impacts have already occurred.

A comparison between potential (pre-mitigation), predicted, and actual groundwater quality for the case study mines is presented in Table ES-6. The majority (64% or 16/25) of the case study mines had exceedences of drinking water standards in groundwater. However, exceedences at three of the mines, all in Nevada, may be related to baseline conditions; therefore, 52% of the case study mines clearly had mining-related exceedences of standards in surface water. Of the 13 mines with mining-related exceedences in groundwater, only two noted a low potential for groundwater quality impacts in the original EIS. The majority (9 or 69%) stated that there would be a moderate potential, and two stated there was a high potential for groundwater impacts in the absence of mitigation. In terms of predicted (post-mitigation) groundwater quality impacts, 77% (10/13) of the mines with exceedences predicted low groundwater quality impacts in their EISs, including mines predicting low impacts in the original EIS.

Of the mines with mining-related groundwater quality exceedences (13), only one mine – the same mine that correctly predicted that there would be surface water exceedences (McLaughlin, CA), was correct in predicting a high potential for groundwater quality impacts with mitigation in place; the others predicted a low potential (not exceeding standards) in at least one EIS. Of the mines without groundwater quality exceedences (5 or 25%), all were correct in predicting no impacts to surface water with mitigation in place. Again, three of the five are desert mines in California, one (Stillwater, MT) has had increases in contaminant concentrations but no exceedences, and the other (Greens Creek, AK) has had mining-related exceedences in seeps. Therefore, most mines predict no impacts to groundwater quality after mitigation were in place, but in the majority of case study mines, impacts have occurred.

Therefore, as with surface water, the predictions made about groundwater quality impacts without considering the effects of mitigation were somewhat more accurate than those made taking the effects of mitigation into account. Again, the ameliorating effect of mitigation on groundwater quality was overestimated in the majority of the case study mines.

A comparison between acid drainage and development for the case study mines is presented in Table ES-7a. Of the 25 case study mines, nine (36%) have developed acid drainage on site to date. Nearly all the mines (8/9) that developed acid drainage either underestimated or ignored the potential for acid drainage in their EISs.

Table ES-5. Summary of Predicted and Actual Impacts to Surface Water Resources at Case Study Mines

Element	Number/Total	Percentage
Mines with mining-related surface water exceedences	15/25	60%
Mines with surface water exceedences that predicted low impacts without mitigation	4/15	27%
Mines with surface water exceedences that predicted low impacts with mitigation	11/15	73%

Table ES-6. Summary of Predicted and Actual Impacts to Groundwater Resources at Case Study Mines

Element	Number/Total	Percentage
Mines with mining-related groundwater exceedences	13/25	52%
Mines with groundwater exceedences predicting low impacts without mitigation	2/13	15%
Mines with groundwater exceedences predicting low impacts with mitigation	10/13	77%

Table ES-7a. Summary of Acid Drainage Potential Predictions and Results for Case Study Mines

Element	Number/Total	Percentage
Mines predicting low acid drainage potential	18/25	72%
Mines that have developed acid drainage	9/25	36%
Mines with acid drainage that predicted low acid drainage potential	8/9	89%

The majority of the case study mines (18/25 or 72%) predicted low potential for acid drainage in one or more EISs. Of the 25 case study mines, 36% have developed acid drainage on site to date. Of these 9 mines, 8 (89%) predicted low acid drainage potential initially or had no information on acid drainage potential. The Greens Creek Mine in Alaska initially predicted moderate acid drainage potential but later predicted low potential for acid drainage for an additional waste rock disposal facility. Therefore, nearly all the mines that developed acid drainage either underestimated or ignored the potential for acid drainage in their EISs.

Of the 25 case study mines, 19 (76%) had mining-related exceedences in surface water or groundwater. However, nearly half of the mines with exceedences (8/19 or 42%) predicted low contaminant leaching potential in their EISs. The constituents that most often exceeded standards or that had increasing concentrations in groundwater or surface water included toxic heavy metals such as copper, cadmium, lead, mercury, nickel, or zinc (12/19 or 63% of mines), arsenic and sulfate (11/19 or 58% of mines for each) and cyanide (10/19 or 53% of mines).

Eight case study mines predicted low contaminant leaching potential (Table ES-7b). Of these eight mines, five (63%) had exceedences of standards in either surface water or groundwater or both after mining began. The three mines that predicted low contaminant leaching potential and had no exceedences of water quality standards were the three California desert mines: American Girl, Castle Mountain, and Mesquite.

Table ES-7b. Summary of Contaminant Leaching Potential Predictions and Results for Case Study Mines (percentages)

Element	Number/Total	Percentage
Mines predicting low contaminant leaching potential	8/25	32%
Mines with mining-related exceedences in surface water or groundwater	19/25	76%
Mines with exceedences that predicted low contaminant leaching potential	8/19	42%
Mines with exceedences that predicted moderate contaminant leaching potential	8/19	42%
Mines with exceedences that predicted high contaminant leaching potential	3/19	16%

Stated another way, 21 of the 25 case study mines (84%) had exceedences of water quality standards in either surface water or groundwater or both. The exceedences at two of these mines may be related to baseline conditions. Therefore, 76% of the case study mines had mining related exceedences in surface water or groundwater (Table ES-7b). Of the remaining 19 mines, 42% (eight) predicted low contaminant leaching potential (or had no information), 42% (eight) predicted moderate contaminant leaching potential, and only three (16%) predicted high contaminant leaching potential. Therefore, nearly half of the mines that had exceedences of water quality standards underestimated or ignored the potential for contaminant leaching potential in EISs. The constituents that most often exceeded standards or that had increasing concentrations in groundwater or surface water included toxic heavy metals such as copper, cadmium, lead, mercury, nickel, or zinc (12/19 or 63% of mines), arsenic and sulfate (11/19 or 58% of mines for each), and cyanide (10/19 or 53% of mines).

CAUSES OF WATER QUALITY IMPACTS AND PREDICTION ERRORS

Inherent Factors Affecting Water Quality at Mine Sites

This study attempts to determine if there are certain factors that make a mine more or less likely to cause water quality problems and more or less likely to accurately predict future water quality. Such factors could include inherent characteristics of the mined materials and the mine, management approaches to handling mined materials and water, and the type and number of geochemical tests that are performed on mined materials. The inherent factors evaluated include: geology and mineralization; proximity to water resources and climatic conditions; and geochemical characteristics of mined materials, such as acid drainage and contaminant leaching potential.

The relationship between inherent hydrologic and geochemical characteristics and water quality impacts shows that mines with close proximity to surface water or groundwater resources and with a moderate to high acid drainage or contaminant leaching potential have an increased risk of impacting water quality.

Surface water impacts for the mines with close proximity to surface water and high acid drainage or contaminant leaching potential are compared to surface water impacts for all the case study mines in Table ES-8. Overall, for the 13 mines with close proximity to surface water and high acid drainage or contaminant leaching potential, 12 (92%) have had some impact to surface water as a result of mining activity. For all case study mines, only 64% had some surface water quality impact. Eleven of the 13 (85%) have had exceedences of standards or permit limits in surface water as a result of mining activity.

Table ES-8. Surface Water Quality Impacts for Mines with Close Proximity to Surface Water and Elevated Acid Drainage Potential Compared to Surface Water Impacts for All Case Study Mines

	# Mines	Percent (%) with Impact to Surface Water	Percent (%) with Exceedences of Standards in Surface Water	Percent (%) with Exceedences that Predicted No Exceedences
Mines with close proximity to surface water and elevated acid drainage and contaminant leaching potential	13	92 (12/13)	85 (11/13)	91 10/11)
All case study mines	25	64 (16/25)	60 (15/25)	73 (11/15)

Of the 11 mines with surface water exceedences, ten (91%) predicted that surface water standards would not be exceeded. Considering the two mines that accurately predicted no surface water exceedences (Stillwater and Flambeau) and the one that accurately predicted exceedences (McLaughlin), 77% of mines with close proximity to surface water or direct discharges to surface water and moderate to high acid drainage or contaminant leaching potential underestimated actual impacts to surface water. For all case study mines, 73% of the mines with surface water quality exceedences predicted that there would be no exceedences. Compared to all case study mines, higher percentages of mines with close proximity to surface water and elevated acid drainage or contaminant leaching potential had surface water quality impacts and exceedences. EIS water quality predictions made before the ameliorating effects of mitigation were considered ("potential" water quality impacts) were more accurate at predicting operational water quality than predictions based on assumed improvements from mitigation.

Groundwater impacts for the mines with close proximity to groundwater and high acid drainage or contaminant leaching potential are compared to groundwater impacts for all the case study mines in Table ES-9. Of the 15 mines with close proximity to groundwater and high acid drainage or contaminant leaching potential, all but one (93%) have had mining-related impacts to groundwater, seeps, springs or admit water. For all case study mines, only 56% had mining-related impacts to groundwater. For the 15 mines with close proximity to groundwater and elevated acid drainage or contaminant leaching potential, 13 or 87% had mining-related exceedences in groundwater. For all case study mines, only 52% had exceedences in groundwater.

Table ES-9. Groundwater Quality Impacts for Mines with Close Proximity to Groundwater and Elevated Acid Drainage Potential Compared to Groundwater Impacts for All Case Study Mines

	# Mines	Percent (%) with Impact to Groundwater or Seeps	Percent (%) with Exceedences of Standards in Groundwater or Seeps	Percent (%) with Exceedences that Predicted No Exceedences
Mines with close proximity to groundwater and elevated acid drainage and contaminant leaching potential	15	93 (14/15)	93 (14/15)	86 (12/14)
All case study mines	25	68 (17/25)	68 (17/25)	52 (13/25)

These results, although not comprehensive, suggest that the combination of proximity to water resources (including discharges) and moderate to high acid drainage or contaminant leaching potential does increase the risk of water quality impacts and is a good indicator of future adverse water quality impacts. Although this finding makes intuitive sense from a risk perspective, a comprehensive study of cause and effect has never been conducted. Mines with these inherent factors are the most likely to require perpetual treatment to reduce or eliminate the long-term adverse impacts to surface water resources. Although all mines must rely on well executed mitigation measures to ensure the integrity of water resources during and after mining, mines with the inherent factors identified in this study must have mitigation measures that are even more carefully designed to avoid water quality impacts.

FAILURE MODES AND ROOT CAUSES OF WATER QUALITY IMPACTS

This section identifies the underlying causes of water quality impacts at the case study mines. It uses information gathered from the case studies and conducts a "failure modes" and "root cause" analysis. A failure is an outcome that is different than intended or predicted. A failure mode is the general type of failure that occurred or is predicted to occur (e.g., prediction failure, mitigation failure), while a root cause is the underlying, more specific, reason for the failure. The objective of the analysis presented in this section is to identify the most common types and causes of failures in protecting water quality at existing mines so that the failures can be prevented in the future. Results from this analysis can be used to make recommendations for improving both the policy and the scientific and engineering underpinnings of EISs.

Methodology and Approach

The approach uses existing ("historical") information from the 25 case study mines with EISs to identify the causes of water quality impacts that occurred during mining operations. In contrast, most similar risk analyses are conducted before operations begin and focus on generating predictions from engineering design information (e.g., likelihood of failure based on factor of safety calculations). Because our approach is retrospective rather than prospective, we know unequivocally whether a prediction has failed or a water quality failure has occurred. Therefore, the focus of this analysis is to determine what caused the failure to occur. The information used to determine how failure occurred is contained in the case studies, which summarize and compare water quality predictions in EISs with actual water quality conditions during mining operations.

Types of Characterization Failures

There are two types of characterization failures identified in the case studies: hydrologic and geochemical. Inaccuracies in hydrologic and geochemical characterization can lead to a failure to recognize or predict water quality impacts. The primary root causes of hydrologic characterization failures identified in this study are:

- dilution overestimated
- lack of hydrological characterization
- amount of discharge overestimated
- size of storms underestimated.

The primary root causes of geochemical characterization failures identified are:

- lack of adequate geochemical characterization
- sample size and/or representativeness.

The other failure mode identified in the case studies is mitigation failure in which the primary root causes are:

- mitigation not identified, inadequate or not installed
- waste rock mixing and segregation not effective
- liner leak, embankment failure or tailings spill
- land application discharge not effective.

Table ES-10 shows the various failures modes, root causes and identifies various mines that serve as examples of the failure modes. The results are summarized in Table ES-11 and are as described below.

Six of 25 mines exhibited inadequacies in hydrologic characterization.

- At two of the mines, dilution was overestimated.
- At two of the mines, a lack of hydrologic characterization was noted.
- At one of the mines, the amount of discharge generated was underestimated.
- At one of the mines, the size of storms was underestimated.

Eleven of 25 mines exhibited inadequacies in geochemical characterization. Geochemical failures resulted from:

- assumptions made about the geochemical nature of ore deposits and surrounding areas (e.g., mining will only be done in oxidized area)
- site analogs inappropriately applied to a new proposal (e.g., historic underground mine workings do not produce water or did not indicate acid generation)
- inadequate sampling (e.g., geochemical characterization did not indicate potential due to composite samples or samples not being representative of actual mining)
- failure to conduct and have results for long-term contaminant leaching and acid drainage testing procedures before mining begins
- failure to conduct the proper tests, or to improperly interpret test results, or to apply the proper models.

Sixteen of 25 mines exhibited failures in mitigation measures.

- At three of the mines mitigation was not identified, inadequate, or not installed.
- At four of the mines waste rock mixing and segregation was not effective.
- At nine of the mines liner leaks, embankment failures or tailings spills caused impacts to water resources.
- At one mine, land application disposal resulted in impacts to water resources.

Table ES-10. Water Quality Predictions Failure Modes, Root Causes and Examples from Case Study Mines

Failure Mode	Root Cause	Examples
Hydrologic Characterization	Lack of hydrologic characterization	Royal Mountain King, CA; Black Pine, MT
	Dilution overestimated	Greens Creek, AK; Jerritt Canyon, NV
	Amount of discharge underestimated	Mineral Hill, MT
	Size of storms underestimated	Zortman and Landusky, MT
Geochemical Characterization	Lack of adequate geochemical characterization	Jamestown, CA; Royal Mountain King, CA; Grouse Creek, ID; Black Pine, MT
	Sample size and/or representation	Greens Creek, AK; McLaughlin, CA; Thompson Creek, ID; Golden Sunlight, MT; Mineral Hill, MT; Zortman and Landusky, MT; Jerritt Canyon, NV
Mitigation	Mitigation not identified, inadequate, or not installed	Bagdad, AZ; Royal Mountain King, CA; Grouse Creek, ID
	Waste rock mixing and segregation not effective	Greens Creek, AK; McLaughlin, CA; Thompson Creek, ID; Jerritt Canyon, NV
	Liner leak, embankment failure or tailings spill	Jamestown, CA; Golden Sunlight, MT; Mineral Hill, MT; Stillwater, MT; Florida Canyon, NV; Jerritt Canyon, NV; Lone Tree, NV; Rochester, NV; Twin Creeks, NV
	Land application discharge not effective	Beal Mountain, MT

Table ES-11. Summary of Failure Modes for Case Study Mines

Failure Mode	Number of Case Study Mines Showing Failure Mode	Percent of Case Study Mines Showing Failure Mode
Hydrologic Characterization	6	24%
Geochemical Characterization	11	44%
Mitigation	16	64%

CONCLUSIONS AND RECOMMENDATIONS

Identification of Risk and Prevention of Impacts

- Actual water quality impacts are closer to potential (pre-mitigation) rather than predicted (post-mitigation) impacts in EISs; therefore, the threshold for significance determinations, and thus EIS (rather than EA) analysis, should be potential rather than predicted impacts.

- Cyanide is not specifically identified as a contaminant of concern often enough; whenever cyanide is being used in heap or vat leaching or flotation, it should be listed as a potential contaminant of concern.

- A minimum and relatively consistent set of geochemical tests should be required by federal and state mining agencies. See the companion report (*Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State- of-the-Art*) for recommendations for minimum required geochemical testing.

- Mines with close proximity or discharges to water resources, moderate to high acid drainage and/or contaminant leaching potential should undergo more scrutiny by agencies in the permitting process than mines with low inherent water quality impact factors.

- Hydrologic characterization failures are most often caused by over-estimation of dilution, failure to recognize hydrologic features and underestimation of water production quantities. They can be addressed by requiring adequate hydrologic characterizations and making environmentally conservative assumptions about water quality and quantity.

- Lack of adequate geochemical characterization is the single-most identifiable root cause of water quality prediction failures. Improvements in geochemical characterization can provide the greatest contribution to ensuring accurate water quality predictions at hardrock mine sites. As noted in the companion report, the same geochemical test units should be used for testing of all sources and parameters used to predict water quality impacts. In addition, more extensive information on mineralogy and mineralization should be included in EISs, and more attention should be paid to uncertainties in geochemical and hydrologic characterization.

- Mixing and segregation mitigation failures occur at a moderate frequency and are typically caused by using too little neutralizing material and not effectively isolating acid generating material from nearby water resources. This can be addressed by requiring adequate geochemical and hydrologic characterization and minimizing transport along hydrologic pathways.

- Mitigation frequently fails to perform according to plan. It is important to consider the likelihood and consequences of mitigation failure in EISs and identify additional mitigation measures that can be installed if failure occurs. Multiple mitigation measures (e.g., installation of liner and leachate collection system or pump-back system) should be required in most cases and planned for in the design phase.

- Improvements are needed in the prediction of appropriate mitigation measures. Preventive mitigation measures are more cost effective and environmentally protective than remediation after impacts have occurred.

- EISs for new mines should include comprehensive baseline water quality, hydrologic, and geochemical evaluations and careful and supportable identification of mitigation measures, including an evaluation of potential mitigation failures.

Data and Data Quality Issues

- Operational and post-operational water quality information for hard rock mine sites should be readily accessible to the public in a user-friendly web-based format.
- Information provided to the public should include: maps clearly showing the location of mine units, streams, and surface water and groundwater sampling locations; identification of facilities/source areas associated (upgradient) with wells and other sampling points; pre-mining and baseline/background water quality and quantity information; well depths; groundwater elevations in monitoring wells; and water quality data for all monitoring locations.
- In many cases existing conditions were explained by baseline water quality conditions with limited baseline water quality information. An independent review of baseline water quality data for hard rock mines should be conducted to verify those claims.
- With the cooperation of industry and regulators, a more systematic and complete effort should be undertaken to compare water quality predictions against actual water quality impacts as a follow-up to this study.

1. INTRODUCTION

When a mine is permitted in the United States, the project proponent (i.e., mining company) must ensure the regulatory agency or agencies that groundwater and surface water quality will not be adversely affected by the proposed mining operations. Based on laboratory and field characterization tests, and in some cases water quality modeling, qualitative or quantitative predictions of operational and post-closure water quality are presented. However, the validity of these predictions is rarely checked after mining begins. During the course of this investigation no single document was discovered comparing National Environmental Policy Act (NEPA) document predictions to actual water quality. This study is the first such effort to evaluate the reliability of water quality predictions for large hardrock mines.

This study is the second in a two-part series on prediction of water quality at hardrock mines. The first report, titled *Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art* (Maest et al., 2005) provides an overview and critique of the mine characterization and modeling techniques that are being used for prediction of water quality at mines in the U.S. and internationally. The objective of the second study, reported in this document, is to review the history and reliability of water quality predictions for major hardrock mines in the United States. In addition, factors contributing to the reliability of the water quality forecasts are identified, and recommendations are presented for improving water-quality predictions.

1.1. METHODOLOGY AND APPROACH

This project utilized water quality predictions made in Environmental Impact Statements (EISs) because EISs require water quality predictions to be made as part of the regulatory review process in NEPA. This report is not intended to address the regulatory process itself but rather the underlying scientific and technical processes, which are employed in EISs to predict water quality impacts.

The overall project methodology/approach consisted of the following phases:

- define and identify all major hardrock mines in the U.S
- identify NEPA/EIS eligibility of major hardrock mines
- identify and gather EISs and related documentation for major mines
- review, compile and analyze relevant EIS documents and related information on water quality predictions
- gather, review and document in case study format EISs and water quality history information for selected mine sites
- compare EIS predictions with actual water quality information for the selected mines
- identify failure modes and root causes of failures to predict water quality impacts
- develop conclusions and recommendations about the effectiveness and regulatory application of the science underlying water quality predictions at hardrock mines

A database (Excel spreadsheet) was created to catalogue general operational and environmental information from NEPA documents and other sources as well as information on discharges to groundwater and surface water for major and mines subject to NEPA. The data collected include the following:

- location (state and county if available)
- ownership
- commodity (gold, silver, copper, molybdenum, lead, zinc, platinum group metals)
- mining (underground, open pit) and processing methods (heap leach, vat leach, flotation, gravity, dump leach (sx/ew), smelter)
- operational status (year production initiated, present status, year closed, projected year closed)
- disturbance and financial assurance (permitted and/or actual disturbance on BLM, Forest Service, private, state, and Native American Indian Lands; current financial assurance amount, bankruptcy status)
- NEPA applicability by BLM, Forest Service, Corps of Engineers, EPA, Indian Lands, state required
- NEPA documentation including year of document, proposed action, document type (EA, EIS, SEIS)

- record of NEPA document requests and retention
- EIS information (summary of information on geology/mineralization; climate; hydrology; field and lab tests performed; constituents of concern identified; predictive models used; water quality impact potential; mitigation; predicted water quality impacts; discharge information)
- National Pollutant Discharge Elimination System (NPDES) permit information (permit number, major or minor permit, whether reported on EPA ECHO database)

The major challenge for this study was obtaining reliable operational water quality data against which predictions can be measured or evaluated. The ease of obtaining such information varies dramatically from state to state. In some states, NEPA or its equivalent that requires water quality predictions, is applied to all mines in the state, while in other states, NEPA derived water quality predictions are applicable only to mines on public lands. In some states, water quality data are available in electronic forms while in others, only paper copies of water quality data are available. In this study we limit our in-depth case study analysis to mines subject to the NEPA process requiring water quality predictions. Therefore, the focus is predominantly on mines on public lands. The mines selected for case study reflect the general population of large hardrock mines in terms of their geographic distribution, commodity types, and other factors. Generally, mines that have exhibited water quality impacts have more water quality data and analysis than mines without notable environmental impacts. In order to balance the analysis, an effort was made to include not only mines with notable impacts in the case studies, but also mines without notable impacts.

For the case study mines, water quality conditions after mining began are compared to water quality predictions and baseline water quality data. If water quality impacts did occur but were not predicted, the causes of the impacts are provided to the extent practicable. Based on this analysis, recommendations for improvements in the scientific underpinnings of the predictions used in the regulatory process are made.

The study is broken into the following sections after the introduction:

- Section 2 provides background information in NEPA and EISs related to water quality predictions at mine sites.
- Section 3 provides a primer on water quality prediction methods and models that have historically been and are presently in use.
- Section 4 provides the basis for defining major and hardrock mines subject of NEPA and summarizes the information describing the major and NEPA applicable mines on state and federal agency basis.
- Section 5 contains information on water quality predictions for each of the 71 major mines where complete information was available. The information collected includes geology and mineralization, climate hydrology, field and lab tests performed, constituents of concern identified, predictive models used, water quality impact potential, mitigation, predicted water quality impacts and discharge information.
- Section 6 consists of case study summaries for selected mines, focusing on predicted and actual water quality impacts.
- Section 7 contains the general results of the study, including a discussion of inherent factors that may predispose a mine to water quality impacts.
- Section 8 identifies the causes for failed predictions and contains recommendations for improving predictions and the regulatory process related to predictions.
- Appendix A provides major mine statistical information by state and federal agency including location (state and where available, county information), commodity produced, extraction and processing methods, and operational status.
- Appendix B provides more complete information on NEPA documents and water quality data.

2. NEPA AND WATER QUALITY PREDICTIONS

The following sections contain a general description of the National Environmental Policy Act (NEPA) and information in the Act related to scientific analysis and water quality predictions.

2.1. NATIONAL ENVIRONMENTAL PROTECTION ACT

When Congress passed the National Environmental Policy Act (NEPA) in 1969 it was heralded as the foundation of modern American environmental protection by providing a comprehensive national policy for focusing on environmental concerns (CEQ 1997). NEPA does not work by mandating that federal agencies achieve particular substantive environmental results. Rather, NEPA requires federal agencies to take a "hard look" at the environmental impacts of certain proposed projects to ensure the necessary mitigation or other measures are employed to meet federal regulations and other applicable (such as state) requirements.

NEPA requires the consideration of the important potential environmental impacts of a proposed action through express statutory mandates, Council on Environmental Quality (CEQ) regulations, and individual federal agency-specific regulations. Further, the broad dissemination of information mandated by NEPA allows the public and other government agencies to participate in the environmental review process and to react to the effects of a proposed action as part of the permitting process.

To those ends, NEPA requires federal agencies proposing major actions that may substantially affect the quality of the human environment to prepare a detailed Environmental Impact Statement (EIS). A "major action" includes actions approved by permit or other regulatory action. EISs are required to describe different alternatives to the proposed action, including the "no action" alternative, in which the proposed action would not be implemented.

In order to determine whether or not a project will have a significant impact on the environment, the federal agency may prepare an Environmental Assessment (EA). If the agency determines, after preparation of the EA, that the project will not significantly impact the environment, then it may issue a Finding of No Significant Impact (FONSI). Otherwise, if the agency finds that the project *may* have a significant impact on the environment, then it must prepare an EIS. In many cases the agency will prepare an EIS from the outset, particularly where the project is likely to be more controversial. EISs are required to describe different alternatives to the proposed action, including the "no action" alternative, in which the proposed action would not be implemented.

The federal agency must consider three types of impacts – direct, indirect, and cumulative. Direct effects are those that are caused by the action and occur at the same time and place. Indirect effects are those that are caused by the action and occur later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include effects on air and water and other natural systems, including ecosystems. A project's "cumulative impact" is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

2.2. SCIENTIFIC ANALYSIS IN THE NEPA PROCESS

The federal agencies are required to describe the environment of the areas to be affected or created by the alternatives under consideration. In order to do so, a baseline against which to compare predictions of the effects of the proposed action is considered to be critical to the NEPA EIS process.

NEPA and its implementing regulations require all federal agencies to:

> [I]nsure the professional integrity, including scientific integrity of the discussions and analysis in environmental impact statements. [Agencies] shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement (40 CFR 1502.24).

Further, the regulations mandate that all NEPA documents be "supported by evidence that the agency has made the necessary environmental analysis" (40 CFR § 1502.1). Consequently, federal agencies have a duty to disclose the underlying scientific data and rationale supporting the conclusions and assumptions in an EIS. Unsupported conclusions and assumptions violate NEPA. The federal courts pay particular attention to this requirement and have found that federal agencies are required to provide the underlying environmental data that are relied upon in the NEPA process. The scientific data and rationale are typically contained in appendices to an EIS.

The importance of scientific integrity and use of high-quality data in the NEPA analysis process cannot be overstated. To satisfy NEPA, the federal agencies "must explicate fully its course of inquiry, its analysis, and its reasoning." (Dubois V. U.S. Department of Agriculture, 102 F.3d 1273, 1287 (1st Cir. 1996)). NEPA provides specific requirements in the case where data or scientific analyses are unavailable to the federal agency. The existence of incomplete or unavailable scientific information concerning significant adverse environmental impacts essential to a reasoned choice among alternatives triggers the requirements of 40 CFR § 1502.22. This provision requires the disclosure and analysis of the costs of uncertainty and the costs of proceeding without more and better information.

40 CFR § 1502.22 imposes three mandatory obligations in the face of scientific uncertainty: (1) a duty to disclose the scientific uncertainty; (2) a duty to complete independent research and gather information if no adequate information exists (unless the costs are exorbitant or the means of obtaining the information are not known); and (3) a duty to evaluate the potential, reasonably foreseeable impacts in the absence of relevant information, using a four-step process. The four step process involves:

1. a statement that such information is incomplete or unavailable;
2. a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;
3. a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and;
4. the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

The requirement to conduct independent research when faced with incomplete or unavailable information insures agencies comply with NEPA's central purpose "to obviate the need for speculation by insuring that available data is gathered and analyzed prior to the implementation of the proposed action." "The federal courts have held that original research should be performed if necessary together with reasonable scientific supported forecasting and speculation." (Save our Ecosystems at 1248-49 and at 1246 note 9)

3. THE SCIENCE OF WATER QUALITY PREDICTION AND MITIGATION

The science of predicting water quality at hardrock mine sites has been practiced for at least the past 30 years as part of the regulatory review process. Under NEPA, hardrock mines in the United States on federal land are required to estimate impacts to the environment, including direct impacts to water quality and indirect impacts that are later in time but still reasonably foreseeable (Kempton and Atkins, 2000; Bolen, 2002). Mines on private land in the United States may also be subject to state or federal processes that may or may not require prediction of potential impacts to water resources. A wide array of scientific approaches ha been used to predict water quality that could result from proposed construction, expansion, or other actions as described in the following sections.

3.1. SITE CONCEPTUAL MODEL

An accurate conceptual model is a necessary first step in successfully predicting water quality at a mine site (Mayer et al., 2002). A conceptual model is a qualitative description of the hydrology and chemistry of the site and their known and potential effect on mined and natural materials. It includes baseline conditions, sources (mining-related and natural), pathways, biophysicochemical processes, mitigation measures, and receptors. Information about sources and mitigation measures will generally come from the mine plan. Site conceptual models should include mitigation measures, and the effectiveness of mitigation measures on water quality should be evaluated.

A mine is an ever-evolving entity, and the site conceptual model must change as the mine evolves. Changes in the mine plan can appreciably affect future water quality. Short of a significant change, however, the accumulation of many small changes in the mine plan can make it difficult to accurately predict water quality. Therefore, predictions themselves must be continually updated as new environmental information from the mine site becomes available.

3.2. GEOCHEMICAL CHARACTERIZATION

The next step in predicting water quality at mines is the characterization of mined materials and the environment. For the purposes of this study, which focuses on water quality at hardrock mine sites, characterization is defined as field and/or laboratory tests or measurements that help define the physicochemical and biological environment that will be or has been mined and the potential for water quality impacts.

Different phases of mining present different opportunities for characterization. During the exploration phase, whole rock analysis, mineralogy, and acid-base accounting should be conducted as part of the delineation of the ore body, and long-term kinetic testing should be initiated. Information on baseline water quality and quantity (including information on similar areas that have already been mined, if relevant) and hydraulic properties should be gathered, and hydrogeochemical modeling for water quality prediction should be initiated.

During the development phase, information on geology, mineralogy, acid-base accounting, kinetic testing, and hydraulic properties should be continued, and more detailed hydrogeochemical modeling should be conducted. During this phase, bench and field scale testing should be conducted, and the effects of mining (e.g., dewatering) on groundwater potentiometric surfaces should be evaluated.

When active mining is underway, geochemical and hydrologic characterization of mined materials should be conducted (including sampling of leachate and testing of hydraulic properties of mined materials and changes in groundwater elevations in response to mining). Up gradient and downgradient water quality in receptors should be sampled, and the first comparisons of predicted and actual water quality can be conducted.

During the closure, reclamation, and post-closure phases of mining, receptor sampling and measurement of changes in groundwater levels should be continued, and improved comparisons of predicted and actual water quality will be possible. During any phase of mining, the extent of a geochemical characterization program should be dictated by site conditions and the nature of the deposit, with complex geology, hydrology, and mineralogy requiring a greater effort.

3.3. WATER QUALITY MODELING

The stages in developing a predictive hydrogeochemical model of water quality for a mine site include:

- developing a site-wide conceptual model
- selecting an appropriate computational code
- gathering site-specific geologic, geochemical, and hydrologic data and fundamental (e.g., thermodynamic) information as inputs for the model
- calibration of the model (for hydrologic models)
- predictive modeling using the model.

Information needed for a site-wide conceptual model includes:

- baseline conditions (hydrogeologic units, existing waste, water quantity/quality, climate)
- sources (location, volume, chemistry)
- pathways (location, connectivity)
- processes (hydrologic, air flow, geochemical, biological)
- receptors (location, water quality/quantity)
- mitigation measures (type, purpose, natural mitigation, effectiveness).

Selection of a computer code to develop a prediction of water quality should be based on factors such as: 1) modeling objectives; 2) capability of the code to simulate important processes affecting water quality at the mine site, as described by the site conceptual model(s); 3) ability of the code to simulate spatial and temporal distribution of key input parameters and boundary conditions; 4) availability of the code and its documentation to the public; and 5) ease of use of the code, including availability of pre- or post-processors and graphical interfaces.

Site-specific inputs to computer codes are needed to make a model that will have relevance to a given mine site. The quality and representativeness of input data will affect the results of the models. Site-specific inputs to hydrogeochemical codes used to predict water quality are similar to certain information needed for conceptual models and can include geologic, hydraulic/hydrologic, chemical, mineralogic, and climatic data.

Model calibration is the process of comparing site-specific observations (e.g., stream flows, groundwater elevations, or pit lake concentrations) with model simulations. Calibration includes adjusting model parameters (e.g., hydraulic conductivity or porosity) so that the output from the model reproduces observed field conditions. The calibrated model is then used to make predictions of future conditions.

At mine sites, much of the modeling performed is "forward" modeling, or modeling of conditions that do not yet exist. In the case of pit lakes, steady-state water quality and quantity conditions may not exist for hundreds of years, yet predictions about the quality of pit water are often required for regulatory purposes. Even though "final" water quality in pit lakes and other receptors may not develop for decades to centuries, water quality at other similar mines can be used to estimate the degree of uncertainty in the prediction.

Figure 3.1 depicts a mine site, pathways, and receptors and shows where hydrologic and geochemical models can be used at mine sites. More information on the methods and models used to predict water quality at hardrock mine sites can be found in the companion study to this report Predicting *Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art* (Maest et al., 2005).

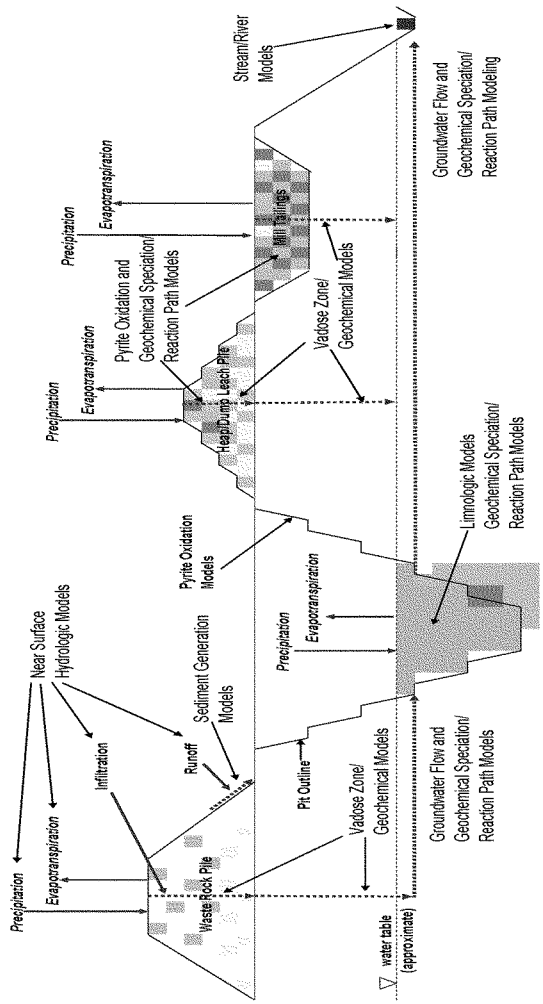


Figure 3.1. A mine site conceptual model with pathways and opportunities for hydrologic and geochemical modeling.

4. IDENTIFICATION OF MAJOR MINES SUBJECT TO NEPA

This section identifies the major hardrock mines in the United States and describes their location, commodity, extraction and processing methods (e.g., underground, open pit), operational status (e.g., operating, closed), extent of physical disturbance, financial assurance amounts, water discharge information under the Clean Water Act, and whether they are subject to the requirements of NEPA. The subset of the mines that is subject to NEPA is described separately, and it is these mines that form the basis of the main analysis in this report. A statistical breakdown is also provided for mines subject to NEPA in terms of NEPA authority (federal agency lead or state agency) and new and subsequent project permitting information. Information on the larger set of major mines and the mines subject to NEPA is contained in a database and Appendix A (database and appendices available at www/kuipersassoc.com or http://www.mineralpolicy.org/publications_welcome.cfm).

4.1. MAJOR MINES

This section describes the method and approach for identifying major mines subject to NEPA and discusses information described above for all mines, mines subject to NEPA, and mines for which EISs were obtained and reviewed in detail.

4.1.1. METHOD AND APPROACH

In order to identify a manageable data set and because they inherently receive the most interest, this study is focused on major hardrock mines. Major mines are defined as those meeting the following criteria:

- disturbance area of over 100 acres and financial assurance amount of over $250,000
- or, financial assurance amount over $1,000,000 alone
- or, cumulative production (1975 to current) of greater than 100,000 ounces of gold, 100,000,000 pounds of copper or the equivalent economic value for other metals

Kuipers (2000) identifies the disturbed area and financial assurance amounts for major mines with financial assurance amounts of over $250,000. In addition, production and other data from Randol (1991, 1995, 1999) and Infomine (2004) were used in establishing the list of major mines for this study.

Information from Kuipers (2000) was initially updated with current disturbance and financial assurance information readily available from regulatory sources (agency websites and publications). Most available information was unchanged from 2000 with the exception of significant updated information from Montana and New Mexico.

Production information was difficult to obtain, although some limited information was available from Randol and Infomine as well as from individual mine sources. The U.S. Geological Survey's Mineral Availability System/ Mineral Industry Locater System (MAS/MILS) is in the process of being overhauled and was unavailable to this study, although the use of coding to protect proprietary data makes the database of limited value to this study. Some mines that could be considered "major" may not meet the above criteria or may not have been included in this list due to the lack of available information.

One hundred eighty three (183) mines in the U.S. were identified as meeting the "major mine" criteria - in terms of meeting minimum disturbance areas and financial assurance or production criteria - and compiled in the Major Mine database. Table 4.1 identifies the major hardrock mines operating from 1975 to present and shows their location, commodity and operational status. Even though the mines subject to NEPA are not discussed until Section 4.2, the mines subject to NEPA and mines reviewed in detail (mines for which EISs were obtained and reviewed) are also identified in Table 4.1. As indicated in the table, for the purposes of this study some mines were combined and are counted as one mine (e.g., Zortman and Landusky, Paradise Peak/Ketchup Flat).

Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present

Name	State	Commodity	Status	NEPA or State Equivalent Eligibility	Federal Agency and/or State	NEPA Documents Obtained
AJ Project	AK	Au	Withdrawn	Yes	EPA	Yes
Fort Knox	AK	Au	Operating	Yes	COE	Yes
Greens Creek	AK	Au, Ag, Pb, Zn	Operating	Yes	FS	Yes
Illinois Creek	AK	Au, Ag	Operating			
Kensington Project	AK	Au	In construction	Yes	FS	Yes
Pogo Project	AK	Au	Operating	Yes	COE, EPA	Yes
Red Dog	AK	Ag, Pb, Zn	Operating	Yes	COE, EPA	Yes
True North	AK	Au	Operating	Yes	COE	Yes
Ajo	AZ	Cu, Mo	Closed			
Bagdad	AZ	Cu, Mo	Operating	Yes	BLM	Yes
Carlotta	AZ	Cu	Permitting	Yes	FS	Yes
Cyprus Tohono	AZ	Cu	Closed	Yes	Indian Lands	Yes
Hayden	AZ	Ag, Cu	Operating			
Miami - PD	AZ	Ag, Cu	Operating	Yes	BLM, FS	Yes
Miami - BHP	AZ	Cu	Operating			
Mineral Park	AZ	Cu	Operating	Yes	BLM	
Mission	AZ	Ag, Cu	Operating	Yes	Indian Lands	Yes
Morenci	AZ	Cu	Operating	Yes	BLM	Yes
Pinto Valley	AZ	Cu, Mo	Closed			
Ray	AZ	Ag, Cu	Operating	Yes	BLM	Yes
Safford (Dos Pobres/San Juan)	AZ	Cu	Permitting	Yes	BLM	Yes
Sanchez	AZ	Cu	Withdrawn	Yes	BLM	Yes
San Manuel	AZ	Au, Ag, Cu, Mo	Closed			
Sierrita	AZ	Cu, Mo	Operating	Yes	BLM	
Silver Bell	AZ	Cu	Operating			
Superior	AZ	Cu	Closed			
Twin Buttes	AZ	Cu, Mo	Closed	Yes	BLM	
Yarnell	AZ	Au	Withdrawn	Yes	BLM	Yes
American Girl (Cargo Muchaco, Oro Cruz)	CA	Au, Ag	Closed	Yes	BLM	Yes
Briggs	CA	Au	Operating	Yes	BLM	Yes
Cactus Gold (Shumake)	CA	Au, Ag	Closed	Yes		
Castle Mountain	CA	Au, Ag	Closed	Yes	BLM	Yes
Carson Hill	CA	Au, Ag	Closed			
Gray Eagle	CA	Au, Ag, Cu, Zn	Closed			
Hayden Hill	CA	Au, Ag	Closed	Yes	BLM, FS	
Imperial	CA	Au	Permitting	Yes	BLM	
Jamestown (California Gold)	CA	Au	Closed	Yes		Yes
McLaughlin	CA	Au	Closed	Yes	BLM	Yes

Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present (continued)

Name	State	Commodity	Status	NEPA or State Equivalent Eligibility	Federal Agency and/or State	NEPA Documents Obtained
Mesquite	CA	Au, Ag	Operating	Yes	BLM	Yes
Picacho	CA	Au	Closed	Yes		
Rand	CA	Au, Ag	Operating	Yes		Yes
Royal Mountain King	CA	Au, Ag	Closed	Yes		Yes
Soledad Mountain	CA	Au, Ag	Closed	Yes	BLM	
Climax	CO	Mo	Closed			
Cresson	CO	Au	Operating			
Empire	CO	Au, Ag	Closed			
Henderson	CO	Mo	Operating			
Pride of the West	CO	Au, Ag	Closed			
San Luis	CO	Au, Ag	Closed			
Summitville	CO	Au, Ag	Closed			
Sunnyside	CO	Au, Ag, Pb, Zn	Closed			
Victor	CO	Au	Operating			
Beartrack	ID	Au, Ag	Closed	Yes	FS	Yes
Black Pine	ID	Au, Ag	Closed	Yes	BLM, FS	Yes
Champagne	ID	Au, Ag	Closed			
Coeur	ID	Ag, Cu	Closed			
Galena	ID	Ag, Cu	Operating			
DeLamar	ID	Au, Ag	Closed			
Sunbeam	ID	Au	Closed	Yes	FS	Yes
Grouse Creek	ID	Au, Ag	Closed	Yes	FS	Yes
Lucky Friday	ID	Ag, Pb, Zn	Operating			
Stibnite	ID	Au, Ag	Closed	Yes	FS	Yes
Stone Cabin	ID	Au, Ag	Closed	Yes	BLM	Yes
Thompson Creek	ID	Mo	Operating	Yes	BLM, FS	Yes
Thunder Mountain	ID	Au	Closed			
Yellow Pine	ID	Au, Ag	Closed		FS	
White Pine	MI	Cu	Closed			
Basin Creek	MT	Au, Ag	Closed	Yes	FS	Yes
Beal Mountain	MT	Au, Ag	Closed	Yes	FS	Yes
Black Pine	MT	Au, Ag, Cu	Closed	Yes	FS	Yes
Continental	MT	Au, Ag, Cu, Mo	Operating	Yes		
Diamond Hill	MT	Au	Closed	Yes		
East Boulder	MT	PGM	Operating	Yes	FS	Yes
Golden Sunlight	MT	Au	Operating	Yes	BLM	Yes
Kendall	MT	Au, Ag	Closed	Yes	BLM	Yes
Mineral Hill	MT	Au, Ag	Closed	Yes	FS	Yes
Montana Tunnels	MT	Au, Ag, Pb, Zn	Operating	Yes		Yes
Montanore	MT	Ag, Cu	Withdrawn	Yes	FS	Yes
Rock Creek	MT	Ag, Cu	Permitting	Yes	FS	Yes
Stillwater	MT	PGM	Operating	Yes	FS	Yes

Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present (continued)

Name	State	Commodity	Status	NEPA or State Equivalent Eligibility	Federal Agency and/or State	NEPA Documents Obtained
Troy	MT	Ag, Cu	Closed	Yes	FS	Yes
Zortman and Landusky	MT	Au, Ag	Closed	Yes	BLM	Yes
Alligator Ridge	NV	Au, Ag	Closed	Yes	BLM	
Aurora Partnership (Mine)	NV	Au, Ag	Closed	Yes	FS	Yes
Austin Gold Venture	NV	Au, Ag	Closed	Yes	FS	Yes
Bald Mountain	NV	Au, Ag	Operating	Yes	BLM	Yes
Horseshoe/Galaxy	NV	Au	Closed			
Battle Mountain Complex (Reona, Copper Basin, Copper Canyon, Iron Canyon, Shoshone-Eureka Phoenix)	NV	Au, Ag	Operating	Yes	BLM	Yes
Big Springs	NV	Au, Ag	Operating	Yes	FS	Yes
Blue Star (Genesis)	NV	Au, Ag	Operating	Yes	BLM	
Bootstrap/Capstone/Tara	NV	Au, Ag	Operating	Yes	BLM	
Borealis	NV	Au, Ag	Closed	Yes	FS	
Buckhorn	NV	Au, Ag	Closed	Yes	BLM	
Bullfrog	NV	Au, Ag	Closed	Yes	BLM	
Candelaria	NV	Au, Ag	Closed	Yes	BLM	
Carlin Mine/Mill # 1	NV	Au, Ag	Operating	Yes	BLM	
Casino/Winrock	NV	Au, Ag	Closed	Yes	BLM	
Rochester	NV	Au, Ag	Operating	Yes	BLM	Yes
Copper Leach Project (Equitorial Tonopah)	NV	Cu	Closed	Yes	BLM	
Cortez	NV	Au, Ag	Operating	Yes	BLM	Yes
Cortez Pipeline (South Pipeline)	NV	Au, Ag	Operating	Yes	BLM	Yes
County Line	NV	Au, Ag	Closed	Yes	BLM	
Crescent Pit	NV	Au, Ag	Operating	Yes	BLM	
Crowfoot/Lewis	NV	Au, Ag	Operating			
Daisy	NV	Au, Ag	Closed	Yes	BLM	
Dee	NV	Au, Ag	Closed	Yes	BLM	Yes
Denton Rawhide	NV	Au, Ag	Operating	Yes	BLM	
Easy Junior	NV	Au, Ag	Closed	Yes	BLM	
Elder Creek	NV	Au, Ag	Closed	Yes	BLM	
Florida Canyon	NV	Au, Ag	Operating	Yes	BLM	Yes
Fondaway Canyon	NV	Au, Ag	Closed	Yes	BLM	
Getchell	NV	Au, Ag	Operating			
Gold Acres	NV	Au, Ag	Operating	Yes	BLM	
Gold Bar	NV	Au, Ag	Closed	Yes	BLM	
Gold Quarry/Maggie Creek	NV	Au, Ag	Operating	Yes	BLM	Yes
Golden Eagle	NV	Au, Ag	Closed	Yes	BLM	

Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present (continued)

Name	State	Commodity	Status	NEPA or State Equivalent Eligibility	Federal Agency and/or State	NEPA Documents Obtained
Goldfield	NV	Au, Ag	Operating	Yes	BLM	
Goldstrike (Betze)	NV	Au, Ag	Operating	Yes	BLM	Yes
Griffon	NV	Au, Ag	Closed	Yes	FS	Yes
Ivanhoe/Hollister	NV	Au, Ag	Operating	Yes	BLM	
Jerritt Canyon	NV	Au, Ag	Operating	Yes	FS	Yes
Dash	NV	Au, Ag	Operating	Yes	FS	Yes
Kinsley Mountain	NV	Au, Ag	Closed	Yes	BLM	
Leeville	NV	Au, Ag	Operating	Yes	BLM	Yes
Lone Tree	NV	Au, Ag	Operating	Yes	BLM	Yes
Manhattan	NV	Au, Ag	Closed	Yes	BLM, FS	
Marigold	NV	Au, Ag	Closed	Yes	BLM	Yes
McCoy/Cove	NV	Au, Ag	Closed	Yes	BLM	
Meikle	NV	Au, Ag	Operating	Yes	BLM	
Mineral Ridge	NV	Au, Ag	Operating	Yes	BLM	
Mount Hamilton	NV	Au, Ag	Closed	Yes	FS	
Mule Canyon	NV	Au, Ag	Operating	Yes	BLM	Yes
North Area Leach	NV	Au, Ag	Operating			
Northumberland	NV	Au, Ag	Closed	Yes	BLM, FS	
Olinghouse	NV	Au, Ag	Closed	Yes	BLM	Yes
Paradise Peak/Ketchup Flat	NV	Au, Ag	Closed	Yes	BLM	
Pete	NV	Au	Operating	Yes	BLM	Yes
Pinson	NV	Au, Ag	Closed	Yes	BLM	
Preble	NV	Au, Ag	Closed	Yes	BLM	
Post/Mill # 4	NV	Au, Ag	Operating			
Rain	NV	Au, Ag	Operating	Yes	BLM	Yes
Robinson (Ruth)	NV	Au, Cu	Operating	Yes	BLM	Yes
Rosebud	NV	Au, Ag	Closed	Yes	BLM	
Round Mountain	NV	Au, Ag	Operating	Yes	BLM, FS	Yes
Ruby Hill	NV	Au, Ag	Operating	Yes	BLM	Yes
Santa Fe/Calvada	NV	Au, Ag	Closed	Yes	BLM	
Sleeper	NV	Au, Ag	Closed	Yes	BLM	
Sterling JV	NV	Au, Ag	Operating	Yes	BLM	
Talapoosa	NV	Au, Ag	Withdrawn	Yes	BLM	
Tonkin Springs	NV	Au, Ag	Closed	Yes	BLM	
Trenton Canyon	NV	Au, Ag	Operating	Yes	BLM	Yes
Triplet Gulch/Robertson	NV	Au, Ag	Closed	Yes	BLM	
Twin Creeks	NV	Au, Ag	Operating	Yes	BLM	Yes
Wind Mountain	NV	Au, Ag	Closed	Yes	BLM	
Yankee	NV	Au, Ag	Closed	Yes	BLM	
Yerington	NV	Cu	Closed	Yes	BLM	
Chino	NM	Cu	Operating		BLM	
Cobre (Continental Pit)	NM	Cu	Closed	Yes	BLM	
Copper Flat	NM	Cu	Closed	Yes	BLM	Yes

Table 4.1. General Information for Major Hardrock Metals Mines in U.S. Operating from 1975 to Present (continued)

Name	State	Commodity	Status	NEPA or State Equivalent Eligibility	Federal Agency and/or State	NEPA Documents Obtained
Cunningham Hill	NM	Au, Ag	Closed			
Questa	NM	Mo	Operating			
Tyrone	NM	Cu	Operating			
Tyrone - Little Rock pit	NM	Cu	Closed	Yes	BLM, FS	Yes
Ridgeway	SC	Au, Ag	Closed			
Brewer	SC	Au	Closed			
Barite Hill	SC	Au	Closed			
Gilt Edge (Anchor Hill)	SD	Au, Ag	Closed	Yes	FS	Yes
Golden Reward	SD	Au, Ag	Closed			
Homestake	SD	Au, Ag	Closed			
Richmond Hill	SD	Au, Ag	Closed			
Wharf	SD	Au, Ag	Operating			
Barneys Canyon	UT	Au, Ag	Operating			
Bingham Canyon - Bingham Pit Fourth Line Expansion Modernization Project Tailing Modernization	UT	Au, Ag, Cu, Mo	Operating			
Drum Mine	UT	Au, Ag	Closed	Yes	BLM	Yes
Escalante Silver	UT	Ag	Closed	Yes	BLM	Yes
Goldstrike Project	UT	Au, Ag	Closed			
Lisbon Valley Copper	UT	Cu	Operating	Yes	BLM	Yes
Mercur Mine	UT	Au, Ag	Closed	Yes	BLM	Yes
Cannon	WA	Au, Ag	Closed	Yes		
Crown Jewel (Buckhorn Mountain)	WA	Au	Permitting	Yes	BLM, FS	
Kettle River/Lamefoot/K2	WA	Au, Ag	Closed	Yes	FS	
Pend Oreille	WA	Pb, Zn	Operating	Yes		
Flambeau (Ladysmith)	WI	Pb, Zn	Closed	Yes		Yes

Table 4.2 contains summary statistics on the information collected for the modern-era (i.e., in operation since 1975) major hardrock mines including location, commodity produced, extraction and processing methods, and operational status. Ownership information was also collected but was not analyzed in this report. The gross statistical data for the major hardrock metals mines in the U.S. was compiled and is summarized and discussed in the following sections. In addition, Appendix A provides a detailed breakdown of the statistical data by state and federal agency.

4.1.2. LOCATION

The 183 modern-era major hardrock metals mines identified are located in 14 states (five major mines were identified in three eastern states, and the remainder were in the western U.S.).

Table 4.2. General Information for Major Hardrock Mines

Feature		All Major Mines	
		Number	%
States	Alaska	8	4.4%
	Arizona	20	10.9%
	California	15	8.2%
	Colorado	9	4.9%
	Idaho	14	7.7%
	Michigan	1	0.5%
	Montana	15	8.2%
	Nevada	74	40.4%
	New Mexico	7	3.8%
	South Carolina	3	1.6%
	South Dakota	5	2.7%
	Utah	7	3.8%
	Washington	4	2.2%
	Wisconsin	1	0.5%
Commodity	Primary Gold	23	12.6%
	Primary Silver	13	7.1%
	Gold and Silver	115	62.8%
	Copper	30	16.4%
	Copper and Molybdenum	8	4.4%
	Molybdenum	4	2.2%
	Lead and Zinc	7	3.8%
	Platinum Group	2	1.1%
Operation Type	Underground	27	14.8%
	Open Pit	132	72.1%
	Underground + Open Pit	22	12.0%
	Heap or Vat Leach	120	65.6%
	Flotation and Gravity	44	24.0%
	Dump Leach (SX/EW)	22	12.0%
	Heap Leach	72	39.3%
	Vat Leach	17	9.3%
	Heap Leach and Vat Leach	31	16.9%
	Smelter	6	3.3%
Status	Operating	82	44.8%
	Closed	89	48.6%
	In Construction	1	0.5%
	Permitting	7	3.8%
	Withdrawn	4	2.2%

As indicated in Table 4.2, 74 (40%) of the major mines are located in Nevada. Nevada's modern-era mines are almost all primary gold and silver mines developed and operated since 1975, although a few notable historic gold and copper mining operations are present in the state.

Arizona, California and Montana are also significant mining states with 20 (11%), 15 (8%) and 15 (8%) respectively located in those states. Arizona's modern-era mines, on the other hand, are nearly all copper mines that were developed and operated from the early 1900s to the 1960s with many still operating. Despite California's illustrious mining history, nearly all its modern-era major mines were developed and operated since 1975. In the same manner, Montana's modern-era major mines were developed and operated since 1975 with the exception of the ongoing copper operations at Butte.

The states of Idaho, Colorado, New Mexico, Utah, Alaska and South Dakota respectively have 13 (8%), nine (5%), seven (4%), seven (4%), eight (4%) and five (3%) of the major mines. Idaho, Colorado, New Mexico and Utah have both historic and new mines. Alaska's and South Dakota's modern-era mines have all been developed and operated since 1975, with the exception of the Homestake Mine located in South Dakota.

Three (2%) of the major mines are located in South Carolina, four (2%) in Washington and one (1%) each in Michigan and Wisconsin. The modern-era major mines in South Carolina, Washington and Wisconsin were all developed and operated since 1975, while the Michigan mine was an historic operation.

No major mines were located in other states. However, some mining was still being conducted in Missouri and Tennessee in 1975, but production at these mines since 1975 has been less than the production criteria identified for major mines included in this study.

4.1.3. COMMODITY

The 183 modern-era major hardrock mines produce gold, silver, copper, molybdenum, lead, zinc and platinum group minerals (platinum and palladium).

As indicated in Table 4.2, two-thirds or 115 (63%) of the mines were identified as gold and silver mines. When combined with the 23 (13%) mines identified as primary gold mines and 13 (7%) mines identified as primary silver mines, 151 (83%) of the modern-era major hardrock mines extract precious metals.

There are 30 (16%) modern-era mines that are primary copper mines, while eight (4%) produce both copper and molybdenum. Four (2%) mines are primary molybdenum mines. Seven (4%) modern-era mines produce lead and zinc, while two (1%) produce platinum group minerals. Some of the mines produce multiple commodities (e.g., gold, silver, lead, zinc); therefore, the number of mines identified in this section is greater than the 183 total mines.

4.1.4. EXTRACTION AND PROCESSING METHODS

The 183 modern-era major hardrock mines are operated by both open pit and underground extraction methods, and employ heap or vat leaching, flotation/gravity, and dump leaching processing methods.

As shown in Table 4.2, the majority of mines (132 or 72%) are operated by open pit methods only. Twenty-seven (15%) of the mines are operated solely by underground mining methods, and 22 (12%) of the mines are operated by combined underground and open pit methods. Following a boom in open pit mining, the trend for gold in particular has been toward underground mining as shallower resources are exploited.

As indicated in Table 4.2, cyanide leaching is the predominant method used for gold ore processing and is used at 120 (66%) of the major mines identified. Seventy-two (38%) of the operations rely on heap leaching processes, while 17 (9%) rely on vat leaching. Thirty-one (17%) use both heap leaching and vat leaching processing methods.

Dump leaching is used exclusively at copper mines, and is the process used at 22 (12%) of the major mines identified. Flotation and gravity processing were the primary process methods used at 44 (24%) of the mines identified.

Six (3%) of the major mines had smelters associated with their operations. These mines were all copper mines.

4.1.5. OPERATIONAL STATUS

As this study takes into account a nearly 30-year time span (1975 to present), many of the 183 mines identified will have operated and subsequently closed. As shown in Table 4.2, 82 (45%) of the mines operated during that period are still currently operating. Eighty-nine (49%) of the major mines that operated have closed during that period. Currently, only one (less than 1%) of the major mines is a new mine (Pogo, Alaska) and is in construction, while

seven (4%) are in permitting. A significant number of the mines identified are expanding, but they are not specifically identified in this study.

4.1.6. DISTURBANCE AND FINANCIAL ASSURANCE

Reliable disturbance and financial assurance information is not readily available outside of the Kuipers (2000) study, which identified the disturbed areas and reclamation amounts for most modern-era major mines in this study. Updated information is not readily available, except for a limited number of mines in certain states. Information on actual or projected disturbed acres and financial assurance amounts was available for only 138 of the 183 major mines in this study.

The 138 mines have actually or are projected to disturb 262,308 acres in total and have an aggregate financial assurance amount of $1.8 billion. The average major mine disturbance area is 1,901 acres, and the average financial assurance amount is $13.2 million.

4.1.7. NPDES INFORMATION

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or other conveyances that discharge to surface waters. In most cases, the NPDES permit program is administered by authorized states, although it may also be administered by the EPA. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our nation's water quality.

Of the 183 major modern-era mines identified in this study, 41 (23%) have NPDES permits according to the EPA's Enforcement History and Online (ECHO) database.[1] EPA classifies larger, more regulated facilities as *major* facilities and smaller facilities as *minor* facilities.[2] On that basis, EPA has classified 27 of the 41 NPDES permitted major mines as major facilities and 14 as minor facilities.

At least four other facilities were identified as having permitted discharges to surface water that were not identified in the search of the ECHO database.

4.2. MAJOR MINES WITH NEPA EIS ANALYSIS

A subset of the 183 identified major modern-era mines is subject to NEPA regulation. For a hardrock mine to be subject to the NEPA process, the six independent requirements are:

- location on federal land administered by the USDA Forest Service
- location on federal land administered by the USDI Bureau of Land Management;
- requirement for new source NPDES permit from EPA
- requirement for 404 wetlands permit from the Army Corp of Engineers (ACE)
- location on Indian Lands administered by the BIA
- state mandated requirement for NEPA equivalent process

---

[1] http://www.epa.gov/echo/

[2] **"Minor discharge"** means a discharge of wastewater which has a total volume of less than 50,000 gallons on every day of the year, does not closely affect the waters of another state and is not identified by the Department, the Regional Administrator or by the Administrator of EPA in regulations issued by him pursuant to Section 307(a) of the Federal Act, as a discharge which is not a minor discharge, except that in the case of a discharge of less than 50,000 gallons on any day of the year which represents one or two or more discharges from a single person, which in total exceeds 50,000 gallons on any day of the year, then no discharge from the facility is a minor discharge.

Of the 183 major modern-era mines identified, 137 (77%). meet the above requirements and are subject to the NEPA process. Of the 137 modern-era hardrock mines subject to NEPA analysis, the following criteria were the requirements used to determine their eligibility for NEPA:

- 93 (68%) are located on BLM administered lands
- 34 (25%) are located on Forest Service administered lands
- nine (7%) are located on both BLM and Forest Service administered lands
- five (4%) required 404 wetlands permits from the COE invoking NEPA
- three (2%) required NPDES permits from EPA invoking NEPA
- two (1%) are located on Indian Lands invoking NEPA
- 23 (19%) are located in states (California, Montana, Wisconsin) that have NEPA requirements
- 17 (14%) require both NEPA for federal purposes and are located in states that have NEPA requirements
- six (5%) require NEPA to meet state requirements only

Table 4.3 summarizes the general information collected for the 137 major hardrock mines subject to NEPA, including location, commodity produced, extraction and processing methods, and operational status. Statistical information for the major hardrock mines subject to NEPA in the U.S. was compiled and is summarized and discussed in the following sections with more detailed information by state and federal agency available in Appendix A.

4.2.1. LOCATION

The 137 modern-era major hardrock mines identified as subject to NEPA are located in 11 states (one major mine subject to NEPA was located in Wisconsin, and the remaining mines are in the western U.S.). States that have major mines but do not have mines subject to NEPA include: Colorado, Michigan and South Carolina.

As indicated in Table 4.3, 69 (50%) of the major mines subject to NEPA are located in Nevada. California, Montana and Arizona are also significant with 13 (10%), 15 (11%) and 13 (10%) of the major mines subject to NEPA respectively located in those states. The states of Idaho, Alaska and Utah respectively have six (4%), seven (5%), and four (3%) of the major mines subject to NEPA. Four (3%) are located in New Mexico, while one (1%) each is located in South Dakota and Wisconsin. In many cases, historically operated mines have succeeded in patenting or otherwise removing land from the public domain and result in no required NEPA analysis, except in states that require NEPA analysis separately. Colorado is notable in this regard, as it historically and presently hosts a significant mining industry, but although nine modern-era major hardrock mines were identified in the state, none were subject to NEPA.

4.2.2. COMMODITY

The 137 major hardrock mines subject to NEPA produce gold, silver, copper, molybdenum, lead, zinc and platinum group minerals (platinum and palladium).

As indicated in Table 4.3, over two-thirds or 90 (66%) of the mines were identified as gold and silver mines. When combined with the 17 (13%) mines identified as primary gold mines and nine (7%) mines identified as primary silver mines, 116 (85%) of the modern-era major hardrock mines subject to NEPA extract precious metals.

There are 21 (15%) modern-era mines subject to NEPA that are primary copper mines, while four (3%) mines produce both copper and molybdenum. Only one (1%) mine is a primary molybdenum mine. Five (4%) modern-era mines subject to NEPA produce lead and zinc, while two (2%) of the mines produce platinum group minerals. Some of the mines produce multiple commodities (e.g., gold, silver, lead, zinc) so the numbers of mines identified in this section total greater than the 137 total mines subject to NEPA.

4.2.3. EXTRACTION AND PROCESSING METHODS

The 137 major hardrock mines subject to NEPA are operated by both open pit and underground mining methods, and employ heap or vat leaching, flotation/gravity, and dump leaching processing methods.

Table 4.3. General Information for Major Mines Subject to NEPA

Feature		All Major Mines	
		Number	%
States	Alaska	7	5.1%
	Arizona	13	9.5%
	California	13	9.5%
	Idaho	6	4.4%
	Montana	15	10.9%
	Nevada	69	50.4%
	New Mexico	4	2.9%
	South Dakota	1	0.7%
	Utah	4	2.9%
	Washington	4	2.9%
	Wisconsin	1	0.7%
Commodity	Primary Gold	17	12.4%
	Primary Silver	9	6.6%
	Gold and Silver	90	65.7%
	Copper	21	15.3%
	Copper and Molybdenum	4	2.9%
	Molybdenum	1	0.7%
	Lead and Zinc	5	3.6%
	Platinum Group	2	1.5%
Operation Type	Underground	19	13.9%
	Open Pit	104	75.9%
	Underground + Open Pit	14	10.2%
	Heap or Vat Leach	95	69.3%
	Flotation and Gravity	28	20.4%
	Dump Leach (SX/EW)	15	10.9%
	Heap Leach	53	38.7%
	Vat Leach	14	10.2%
	Heap Leach and Vat Leach	28	20.4%
	Smelter	2	1.5%
Status	Operating	64	46.7%
	Closed	61	44.5%
	In Construction	1	0.7%
	Permitting	6	4.4%
	Withdrawn	5	3.6%

As shown in Table 4.3, the majority of mines 104 (76%) are operated by open pit methods only. Nineteen (14%) of the mines are operated solely by underground mining methods. Fourteen (10%) of the mines are operated by combined underground and open pit methods.

As indicated in Table 4.3, cyanide leaching is the predominant method used for gold ore processing and is used at 95 (69%) of the major mines subject to NEPA identified. Fifty-three (39%) of the operations rely on heap leaching processes, while 14 (10%) rely on vat leaching. Twenty-eight (20%) of these mines use both heap leaching and vat leaching processing methods.

Dump leaching is used exclusively at copper mines, and is the process used at 15 (11%) of the major mines subject to NEPA identified. Flotation and gravity processing were the primary process methods used at 28 (20%) of the mines subject to NEPA identified.

Two (2%) of the major mines subject to NEPA had smelters associated with their operations. These mines were both copper mines.

4.2.4. OPERATIONAL STATUS

As this study takes into account a time span of approximately 30 years (1975 to present), many of the 137 major mines subject to NEPA identified will have operated and closed. As shown in Table 4.3, 64 (47%) of the mines subject to NEPA operated during that period are still currently operating. Sixty-one (45%) of the major mines subject to NEPA that operated have closed during that period. Currently, only one (less than 1%) new mine subject to NEPA (Pogo, Alaska) is in construction, while six (4%) are in permitting, and five (4%) were withdrawn from the permitting process.

4.3. COLLECTION OF EISS FOR MINES SUBJECT TO NEPA

EISs were performed at 82 (60%) of the 137 major mines subject to NEPA, either as part of new permitting actions or as part of later expansion or other subsequent actions. EAs only, based on agency regulatory findings of no significant impact, were performed at the remainder of the mines subject to NEPA. The EISs resulted from the following conditions or mine site actions:

- ten (7%) of the mines with EISs were in operation prior to NEPA enactment but had later EISs for expansion or other (e.g., land swap) purposes
- twenty (15%) out of 71 (51%) mines originally permitted as new operations with EAs had subsequent EISs related primarily to expansion proposals
- fifty-two (38%) of the mines subject to NEPA were originally permitted as new projects with EISs

EISs and EAs were obtained by writing, emailing, and/or calling state and federal agencies, including the BLM, USDA Forest Service, and tribal agencies, as well as conducting library searches. Some agencies were quick to respond to our requests and provided information promptly. Most agencies required a written Freedom of Information Act (FOIA) request letter, and most were honored within 30 days of receipt, while others took months to respond. There were several agencies that denied our FOIA request for a fee waiver and charged copying fees for documents. Due to the cost of copying, some documents were not acquired. There were occasions for older mines where the agencies no longer had copies of the NEPA documents because they had been "loaned out" and never returned or older documents were "thrown out" to make room for new projects. The process of obtaining NEPA documents took approximately 16 months and involved numerous follow-up calls, written, and email contact.

Of the 137 major mines subject to NEPA, 71 mines had documents that were obtained and reviewed. A total of 104 NEPA documents, either EISs or EAs, were reviewed for the 71 mines. Table 4.4 identifies the 71 NEPA mines that were reviewed for this study and summarizes information on the location, commodity, extraction, processing methods and operational status for the 71 mines reviewed. The general statistical data for the major hardrock metals mines subject to NEPA reviewed in the U.S. are summarized and discussed in the following sections.

4.3.1. LOCATION

The 71 modern-era major hardrock mines with EISs that were reviewed are located in 10 different states. One major mine is located in the mid-west (Wisconsin), seven are in Alaska, and the remaining mines are in the western contiguous U.S.

As indicated in Table 4.4, 24 (34%) of the major mines with EISs that were reviewed are located in Nevada. Arizona, California and Montana are also significant with eight (11%), eight (11%) and 13 (18%) respectively located in those states. The states of Idaho, New Mexico and Alaska respectively have six (9%), two (3%) and seven (10%). South Dakota, Utah and Wisconsin each have one (1%) of the major mines with reviewed EISs.

Table 4.4. General Information for Mines with Reviewed EISs

Feature		All Major Mines	
		Number	%
	Alaska	7	9.9%
	Arizona	8	11.3%
	California	8	11.3%
	Idaho	6	8.5%
	Montana	13	18.3%
	Nevada	24	33.8%
	New Mexico	2	2.8%
	South Dakota	1	1.4%
	Utah	1	1.4%
	Wisconsin	1	1.4%
Commodity	Primary Gold	14	19.7%
	Primary Silver	5	7.0%
	Gold and Silver	39	54.9%
	Copper	14	19.7%
	Copper and Molybdenum	1	1.4%
	Molybdenum	1	1.4%
	Lead and Zinc	4	5.6%
	Platinum Group	2	2.8%
Operation Type	Underground	13	18.3%
	Open Pit	51	71.8%
	Underground + Open Pit	7	9.9%
	Heap or Vat Leach	44	62.0%
	Flotation and Gravity	19	26.8%
	Dump Leach (SX/EW)	8	11.3%
	Heap Leach	18	25.4%
	Vat Leach	10	14.1%
	Heap Leach and Vat Leach	16	22.5%
	Smelter	1	1.4%
Status	Operating	35	49.3%
	Closed	26	36.6%
	In Construction	1	1.4%
	Permitting	5	7.0%
	Withdrawn	4	5.6%

4.3.2. COMMODITY

The 71 modern-era major hardrock mines with EISs that were reviewed produce gold, silver, copper, molybdenum, lead, zinc and platinum group minerals (platinum and palladium).

As indicated in Table 4.4, 39 (55%) of the mines were identified as gold and silver mines. When combined with the 14 (20%) mines identified as primary gold mines and five (7%) mines identified as primary silver mines, 58 (82%) of the modern-era major hardrock mines with reviewed EISs extract precious metals.

There are 14 (20%) modern-era mines with reviewed EISs that are primary copper mines, while one (1%) produces both copper and molybdenum. Only one (1%) is a primary molybdenum mine. Four (6%) of the mines produce lead and zinc, and two (3%) produce platinum group minerals. Some of the mines produce multiple commodities (e.g., gold, silver, lead, zinc); therefore, the numbers of mines identified in this section have a total greater than the 137 mines subject to NEPA.

4.3.3. EXTRACTION AND PROCESSING METHODS

The 71 modern-era major hardrock mines with EISs reviewed are operated by both open pit and underground mining methods, and employ heap or vat leaching, flotation/gravity, and dump leaching process methods.

As shown in Table 4.4, the majority of mines (51 or 72%) are operated by open pit methods only. Thirteen (18%) of the mines are operated solely by underground mining methods. Seven (10%) of the mines are operated by combined underground and open pit methods.

As indicated in Table 4.4, cyanide leaching is the predominant method used for gold ore processing and is used at 44 (62%) of the major mines with reviewed EISs. Eighteen (25%) of the operations rely on heap leaching processes, while 10 (14%) rely on vat leaching. Sixteen (23%) use both heap leaching and vat leaching processing methods.

4.3.4. OPERATIONAL STATUS

Many of the 71 mines with reviewed EISs have operated and subsequently closed during the 30-year time span (1975 to present) of this study. As shown in Table 4.4, 35 (49%) of the mines operated during that period are currently operating. Twenty-six (37%) of the major mines that operated have closed during that period. Currently, one (less than 1%) new mine (Pogo, Alaska) is in construction, while 5 (7%) are in permitting.

4.3.5. NPDES INFORMATION

According to the EPA's Enforcement History and Online (ECHO) database, 19 (27%) of the 71 major modern-era mines subject to NEPA reviewed in detail have NPDES permits. EPA classifies larger, more regulated facilities as *major* facilities and smaller ones as *minor* facilities. On that basis, EPA has classified nine of the 19 NPDES permitted major mines as major facilities and 10 as minor facilities.

At least one other major mine subject to NEPA was identified as having permitted discharges to surface water that were not identified in the search of the ECHO database.

4.4. COMPARISON OF MINE INFORMATION

A comparison of the statistical results for major mines, major mines subject to NEPA, and major mines subject to NEPA with EISs reviewed are provided in Table 4.5. The table shows that the various categories of mines are comparable and that the NEPA subject mines with EISs reviewed in detail are reasonably comparable to the major hardrock metals mines and NEPA subject mines based on general statistical information.

The hardrock mines in the United States are spread over 14 states, most of them in the western United States. The mines with reviewed EISs cover 10 states, excluding Colorado, Michigan, South Carolina, and Washington. Colorado, Michigan, and South Carolina have no mines subject to NEPA, so mines from these states were excluded from review based on the constraints of the study. The mines subject to NEPA with EISs reviewed in detail are similar to all major mines and all major mines subject to NEPA in terms of commodity type. The mines reviewed in detail have a somewhat larger representation of primary gold mines and copper mines, but a somewhat smaller percentage of combined gold and silver mines. In terms of extraction methods, the mines subject to NEPA with reviewed EISs have a somewhat higher proportion of underground mines compared to all major mines and all major

mines subject to NEPA but are otherwise quite similar to the larger dataset. For processing methods, the mines subject to NEPA with reviewed EISs have a somewhat lower percentage of heap leach operations and a somewhat higher proportion of vat leach operations but are otherwise quite similar to the larger dataset. In terms of operational status, the mines subject to NEPA with EISs reviewed have a somewhat higher proportion of operating mines and a lower percentage of closed mines but are otherwise similar to the larger dataset. These differences will favor examination of the more modern mines in the United States.

Table 4.5. Comparison of Major Mines, Major Mines Subject to NEPA and Major Mines Subject to NEPA with EISs Reviewed in Detail

Feature		Major Mines	Major Mines Subject to NEPA	Major Mines Subject to NEPA with EISs Reviewed in Detail
		% of total mines in category		
States	Alaska	4.40%	5.10%	9.90%
	Arizona	10.90%	9.50%	11.30%
	California	8.20%	9.50%	11.30%
	Colorado	4.90%		
	Idaho	7.70%	4.40%	8.50%
	Michigan	0.50%		
	Montana	8.20%	10.90%	18.30%
	Nevada	40.40%	50.40%	32.40%
	New Mexico	3.80%	2.20%	2.80%
	South Carolina	1.60%		
	South Dakota	2.70%	0.70%	1.40%
	Utah	3.80%	2.90%	1.40%
	Washington	2.20%	2.90%	
	Wisconsin	0.50%	0.70%	1.40%
Commodity	Primary Gold	12.60%	12.40%	19.70%
	Primary Silver	7.10%	6.60%	7.00%
	Gold and Silver	62.80%	65.70%	54.90%
	Copper	16.40%	15.30%	19.70%
	Copper and Molybdenum	4.40%	2.90%	1.40%
	Molybdenum	2.20%	0.70%	1.40%
	Lead and Zinc	3.80%	3.60%	5.60%
	Platinum Group	1.10%	1.50%	2.80%
Operation Type	Underground	14.80%	13.90%	18.30%
	Open Pit	72.10%	75.90%	71.80%
	Underground + Open Pit	12.00%	10.20%	9.90%
	Heap or Vat Leach	65.60%	69.30%	62.00%
	Flotation and Gravity	24.00%	20.40%	26.80%
	Dump Leach (SX/EW)	12.00%	10.90%	11.30%
	Heap Leach	39.30%	38.70%	25.40%
	Vat Leach	9.30%	10.20%	14.10%
	Heap Leach and Vat Leach	16.90%	20.40%	22.50%
	Smelter	3.30%	1.50%	1.40%
Operational	Operating	44.80%	46.70%	49.30%
	Closed	48.60%	44.50%	36.60%
	In Construction	0.50%	0.70%	1.40%
	Permitting	3.80%	4.40%	7.00%
	Withdrawn	2.20%	3.60%	5.60%

5. WATER QUALITY PREDICTIONS INFORMATION

Information relevant to water quality predictions was collected by reviewing the available scientific and technical documentation for each of the 71 major mines where complete information in the form of EISs or EAs was available. The information collected consisted of the following elements:

- geology/mineralization
- climate
- hydrology
- field and lab tests performed
- constituents of concern identified
- predictive models used
- water quality impact potential
- mitigation
- predicted water quality impacts
- discharge information

Some of the elements contain sub-elements. For example, hydrology includes the sub-elements of surface water hydrology (proximity to surface water) and groundwater hydrology (depth to groundwater). For each type of information, a score was derived to characterize the element (e.g., geology/mineralization used six scores, including one for no information provided). The scoring allowed statistics to be performed on the information in the NEPA documents. All of the elements except for constituents of concern and mitigation have percentages that add to 100 percent. Because a given mine could have more than one type of constituent of concern (e.g., metals and metalloids and cyanide), scores will sum to greater than 100 percent. Similarly, a given mine could have more than one type of groundwater mitigation or surface water mitigation (e.g., source controls and monitoring and perpetual treatment), and scores will also sum to greater than 100 percent. Although a given mine could have conducted more than one type of field or laboratory geochemical characterization test, the scores were so that each mine had a unique score (e.g., one category is static testing only, and another is static, short-term leach, and kinetic testing).

In a number of instances, multiple EISs or EAs were reviewed for a given mine. For those mines, different approaches were used to concatenate the scores into one score per mine site. In general, the most environmentally conservative score was used as the bulk score for the mine. For example, for surface water proximity (a sub-element of hydrology), the score from the EIS that noted the closest proximity to surface water was used. The approach for concatenating scores from multiple EISs is described, where relevant, for each element and sub-element.

With the exception of the climate classifications, all scoring was based on information available in the EISs or EAs. If information or a subset of the information was not described in the EIS or EA, other additional sources of information to describe the element were not used. In this way, the scores reflect only the information that was considered by the regulators in the environmental review process.

5.1. SUMMARY OF RESULTS

The information summarized in this section was derived from the 71 mines reviewed for this study that were subject to the regulatory requirements of NEPA that resulted in water quality predictions. All information in this section was collected from the reviewed EISs or EAs and is a summary of or an exact replica or that information as it appeared in the document. In most cases, the information was scored to allow for statistical analysis. For mines with multiple EISs and/or EAs, only one final score was used in the tables and statistical analysis. In most cases, this was the most environmentally conservative score. For example, for groundwater depth, the score denoting the shallowest depth to groundwater was used, and for acid drainage potential, the score indicating the highest acid drainage potential was used.

Geology and mineralization information focused primarily on the geologic and mineralogical characteristics of the ore and the surrounding rock that would make mined materials more or less susceptible to acid drainage generation. The synopsis is only a generalized overview of all the rock types and mineralization present at the site, especially for rocks in the area of the ore deposit that will be mined. The major categories scored varied from low potential to create acid drainage to high potential to generate acidity with the following results:

- No/insufficient information available (23%)
- Low sulfide content, carbonate present or hosted in carbonate (10%)
- Low sulfide content, low carbonate content/carbonate not mentioned (7%)
- Sulfides present, carbonate or moderate to high NP rock present (33%)
- Sulfides present, no carbonates/carbonates not mentioned or associated with ore body (23%)
- High sulfide content, carbonates low/not present (3%)

Climate information gathered included general descriptions of climate type (i.e., arid, semi arid, coastal marine, northern, etc), precipitation data, and evaporation data. The climate - type descriptions in the NEPA documents varied substantially in detail and scope of coverage. The modified Köppen system was used to denote the major climate regions and their sub-classifications, and the results for the NEPA mines were with the following results:

- Dry/Arid Low and Middle Latitude Deserts (20%)
- Dry/Semi-Arid Middle Latitude Climates (35%)
- Humid Subtropical (4%)
- Marine West Coast (4%)
- Boreal Forest (28%)
- Continental (3%)
- Sub-Arctic (4%)

Hydrology information gathered included information on surface water proximity and depth to groundwater depth. Information on surface water proximity was classified as:

- No information provided (7%)
- Intermittent/ephemeral streams on site - perennial streams >1 mile away (26%)
- Intermittent/ephemeral streams on site - perennial streams <1 mile away (25%)
- Perennial streams on site (44%)

Depth to Groundwater information was classified as:

- No information provided (12%)
- Depth to groundwater > 200 feet (16%)
- Depth to groundwater < 200 but >50 feet (13%)
- Depth to groundwater 0 to 50 feet and/or springs on site (59%)

Laboratory and field geochemical testing methods information gathered focused on the main types of geochemical characterization tests used: static, short-term leach and kinetic testing, and fell into the following categories:

- No information (10%)
- Static testing only (13%)
- Short-term leach testing only (6%)
- Kinetic testing only (2%)
- Static and short-term leach testing (17%)
- Static and kinetic testing (16%)
- Short-term leach and kinetic testing (2%)
- Static, short-term leach, and kinetic testing (35%)

Constituents of concern (COC's) were identified in the EISs and included:

- None/insufficient information (16%)
- Metals (74%)
- Radionuclides (1%)
- Cyanide (23%)
- Metalloids, oxyanions (55%)
- Conventional pollutants (49%)

Predictive models were used in the EISs with the following frequency:

- No predictive models used (44%)
- Only water quantity predictive models used (26%)
- Only water quality predictive models used (2%)
- Both water quantity and water quality predictive models used (29%)

This report distinguishes between potential and predicted water quality impacts. A potential water quality impact is one that could occur if mitigation are not in place, and predicted water quality impacts are those that threaten water quality even after mitigation are in place. Potential water quality impacts are related to the inherent characteristics of the mine location or of the mined materials, such as acid drainage and contaminant leaching, climate, and proximity to water resources. Potential water quality impacts are described in the NEPA documents. The elements of water quality impact potential included acid drainage potential, contaminant leaching potential, and potential groundwater, surface water, and pit water impacts.

Acid drainage potential was summarized and scored as follows:

- No information available (9%)
- Low acid drainage potential (58%)
- Moderate acid drainage potential (6%)
- High acid drainage potential (27%)

Contaminant leaching potential was summarized and scored as follows:

- No information available (22%)
- Low contaminant leaching potential (leachate does not exceed water quality standards) (32%)
- Moderate potential for elevated contaminant concentrations (leachate exceeds water quality standards by 1-10 times) (30%)
- High potential for elevated contaminant concentrations (leachate exceeds water quality standards by over 10 times) (17%)

Groundwater impact potential was summarized and scored as follows:

- No information available (20%)
- Low groundwater quality impacts (< relevant standards) (25%)
- Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) (48%)
- High groundwater quality impacts (>10 times relevant standards) (7%)

Surface water impact potential was summarized and scored as follows:

- No information available (23%)
- Low surface water quality impacts (< relevant standards) (33%)
- Moderate surface water quality impacts (≥ and up to 10 times relevant standards) (41%)
- High surface water quality impacts (>10 times relevant standards) (3%)

Pit water impact potential was summarized and scored as follows:

- No information available (22%)
- Low pit water quality impacts (water quality similar to surrounding groundwater or < relevant standards) (12%)
- Moderate pit water quality impacts (≥ and up to 10 times relevant standards) (17%)
- High pit water quality impacts (>10 times water quality standards) (14%)
- No pit lake or water expected (pit above water table or no pit) (35%)

EISs analyze and may require mitigation to address potential water quality impacts that are identified. Mitigation measures are commonly designed for the protection of groundwater and surface water resources, and may address pit water quality (depending on state requirements). Water-quality mitigation identified in the EISs fell into groundwater, surface water, and pit water measures. For mines that proposed treatment as part of the mitigation measures, the type of treatment was also categorized and scored.

Proposed groundwater mitigation were summarized and scored as follows (total exceeds 100% as some mines employ multiple mitigation):

- No information available or no mitigation identified (17%);
- Groundwater monitoring or characterization of mined materials (48%);
- Source controls without treatment (liners, leak detection systems, run on/off controls, caps/covers, adit plugging) (71%);
- Groundwater/leachate capture with treatment (38%);
- In-perpetuity groundwater capture and/or treatment; long-term mitigation fund (4%);
- Liming, blending, segregation, etc. of potentially acid-generating (PAG) material (19%).

Proposed surface water mitigation were summarized and scored as follows:

- No information available or no mitigation identified (15%);
- Surface water monitoring (14%);
- Stormwater, sediment, or erosion controls (68%);
- Source controls not involving capture of water (including liners, adit plugging, caps/covers, leak detection systems, spill prevention measures, and liming/blending/segregating of PAG materials) (30%);
- Surface water/leachate capture and/or treatment (including settling, land application, routing of water, seepage collection) (30%);
- Perpetual surface water capture and/or treatment (3%);
- Surface water augmentation or replacement (3%).

Proposed pit water mitigation were summarized and scored as follows:

- No information provided or none identified (25%);
- Pit lake monitoring (9%);
- Pit lake prevention (backfill, pumping, stormwater diversion, use in mine operation) (41%);
- Treatment of pit water or backfill amendment (e.g., lime addition) (9%);
- Not applicable: no pit lake will form (underground mine or pit above water table) (33%);
- Contingency or research fund for pit lake, adaptive management (3%).

Proposed water treatment measures were summarized and scored as follows:

- No information provided or no water treatment measures identified (70%);
- Solids or sediment settling ponds (9%);
- Water treatment for cyanide (9%);
- Water treatment for metals and/or acid drainage (22%);
- Water treatment using non-conventional approaches (15%);
- Perpetual water treatment (6%).

A predicted water quality impact is one that could occur after mitigation is in place. It is these predicted, or post-mitigation, impacts that are considered by regulators when evaluating whether a proposed mine will meet applicable water quality standards.

Predicted groundwater quality impacts were summarized and scored as follows:

- No information available (9%)
- Low groundwater quality impacts (< relevant standards) (80%)
- Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) (6%)
- High groundwater quality impacts (>10 times relevant standards) (6%)

Predicted surface water quality impacts were summarized and scored as follows:

- No information available (9%)
- Low surface water quality impacts (< relevant standards) (83%)
- Moderate surface water quality impacts (≥ and up to 10 times relevant standards) (7%)
- High surface water quality impacts (>10 times standards) (1%)

Predicted pit water quality impacts were summarized and scored as follows:

- No information available (16%)
- Low pit water quality impacts (concentrations less than relevant standards or water quality similar to surrounding groundwater) (17%)
- Moderate pit water quality impacts (≥ and up to 10 times relevant standards) (19%)
- High pit water quality impacts (>10 time relevant standards) (13%)
- No pit lake or water expected (underground mine or pit above the water table (35%)

In many cases, EISs identified mines or certain facilities at mines (e.g., heap leach pads or tailings impoundments) as "zero discharge" facilities. Many mines also had discharges to surface water that are regulated by either federal National Pollution Discharge Elimination System (NPDES) permits or similar permits issued by individual states under EPA authority.

Discharges were summarized and scored as follows:

- Zero Discharge Facilities (39%)
- Surface Water Discharge Permit (41%)
- Groundwater Discharge Permit (6%)

Each of the following sections describes the approach to categorizing the relevant NEPA information and summarizes and discusses the information collected from the 71 major mines for which we reviewed NEPA documentation. In Tables 5.5 through 5.22, the 25 mines subsequently chosen as case study mines are indicated by an asterisk (*). Identifying them in this section allows for a visual review of the variability in elements that may affect operational water quality.

5.2. GEOLOGY AND MINERALIZATION

Geology and mineralization information collected from the NEPA documents included rock type (e.g., general categories such as igneous, sedimentary, and metamorphic, and more detailed categories such as granite, dolomite, and greenstone), and information on mineralogy/ mineralization, alteration and ore associations. Plumlee and others have suggested that knowledge about mineralization type can help to predict the environmental behavior of ore deposits (e.g., Seal and Hammarstrom, 2003, for massive sulfide and gold deposits). Table 5.1 lists these mineralization types, examples, and associated rock types.

Table 5.1. Mineralization Types, Examples and Associated Rock Types

Mineralization Types	Examples	Associated Rock Types
Volcanogenic massive sulfide (VMS) deposits	Iron Mountain CA, Blackbird mine, ID	Volcanic: basaltic (Cyprus type), rhyolitic-andesitic (Kuroko-type); sedimentary rock such as turbidites and black shales (Besshi-type)
High sulfidation epithermal (quartz alunite epithermal) deposits	Summitville, CO, Red Mountain Pass, CO, Goldfield and Paradise Peak, NV, Mt. Macintosh, BC, Julcani, Peru	Silicic volcanic or intrusive rocks (e.g., quartz latite)
Porphyry Cu and Cu-Mo deposits	Globe, AZ, Mt.Washington, BC, Alamosa CO	Altered, intermediate-composition intrusive rocks
Cordilleran lode deposits	Butte, MT; Magma, AZ, Quiruvilca, Peru	Altered, intermediate-composition intrusive rocks
Climax-type porphyry Mo deposits	Climax, Henderson, Mt. Emmons, CO	Silica- and uranium-rich granitic or rhyolitic intrusions
Polymetallic vein deposits and adularia-sericite epithermal vein deposits	Central City, CO (polymetallic vein); Creede and Bonanza, CO; Comstock NV; Sado, Japan (adularia-sericite)	igneous intrusions
Hot-spring Au-Ag and Hg deposits	Leviathan, Sulphur Bank, and McLaughlin, CA; Round Mountain, NV	Epithermal and vein deposits; volcanic rocks
Skarn and polymetallic replacement deposits	Leadville, Gilman, and Rico, CO; New World, MT; Park City and Tintic, UT. Skarn deposits associated with porphyry-Mo, -Cu- Mo and -Cu deposits - Yerington, NV; Chino, NM	Outermost portions of intrusions or in sediments adjacent to the intrusions
Stratiform shale-hosted (SEDEX) deposits	Red Dog, Lik, and Drenchwater, Alaska; Sullivan, BC; Mt. Isa and Broken Hill, Australia	Black shale and chert-bearing host rocks
Mississippi-Valley-Type (MVT) deposits	Old Lead Belt, Viburnum Trend in Missouri, Tri-State (Missouri, Kansas, and Oklahoma), Northern Arkansas, Upper Mississippi (Wisconsin), and Central Tennessee districts	Dolostones, limestones, sandstones in sedimentary basins
Magmatic sulfide deposits	Sudbury Complex, Ontario; Duluth Complex, Minnesota; Stillwater Complex, MT; Bushveld Complex, South Africa	Layered mafic intrusions, ultramafic volcanic rocks or ultramafic accumulations
Banded-iron formation (BIF) deposits	Superior-type deposits -- Mesabi Iron Range, Minnesota; Marquette Iron Range, Michigan	Chemical sediments in which iron oxides, carbonates, silicates or sulfides are finely interlaminated or interbedded with chert or jasper.
Low-sulfide, gold-quartz vein deposits	Juneau Gold Belt and Fairbanks, Alaska; Mother Lode, CA	In quartz veins in medium-grade greenstone metamorphic rocks
Alkalic Au-Ag-Te vein deposits	Cripple Creek, CO; Boulder County, CO; Ortiz, NM; Zortman and Landusky, MT.	Diatremes or breccia pipes in alkalic igneous intrusive complexes

Source: Plumlee et al., 1999.

A synopsis of the geology and mineralization information for each mine with NEPA documentation was developed, focusing primarily on the geologic and mineralogical characteristics of the ore and the surrounding rock that would

make mined materials more or less susceptible to acid drainage generation. The synopsis is only a generalized overview of all the rock types and mineralization present at the site, especially for rocks in the area of the ore deposit that will be mined. Based on the synopsis, a score was developed for each mine that focused on sulfide content and the presence of carbonates or other type of neutralizing rock or minerals. The score represents the overall reported mineralization, but rocks of one type could dominate environmental behavior at a given mine site. The major categories scored varied from low potential to create acid drainage to high potential to generate acidity and were:

- No/insufficient information available (0)
- Low sulfide content, carbonate present or hosted in carbonate (1)
- Low sulfide content, low carbonate content/carbonate not mentioned (2)
- Sulfides present, carbonate or moderate - high NP rock present (3)
- Sulfides present, no carbonates/carbonates not mentioned or associated with ore body (4)
- High sulfide content, carbonates low/not present (5)

A list of rock types and names and their associated relative neutralizing and acid-generating potential is taken from Plumlee (1999) and is contained in Table 5.2. In some cases, the geology of the deposit provided neutralizing ability, even if the rock type was other than carbonate. For example, the layered mafic intrusions of the Stillwater and East Boulder mines in Montana have inherent neutralizing ability even though they do not have carbonates. In addition, skarn deposits (which are not listed in Table 5.1), such as at the Battle Mountain Complex in Nevada and certain kinds of volcanic tuffs, such as at the Florida Canyon Mine in Nevada, can also provide moderate to high neutralizing ability.

Table 5.2. Rock Types and Names and Associated Relative Neutralizing and Acid-Generating Potential.

Rock Type	Subcategory	Rock Name	Relative Neutralizing and Acid-Generating Potential
Sedimentary	Chemical/ Biological	Limestone	High NP
		Dolomite	Mod – high NP
		Chert	Mod NP
	Detrital	Black Shale	Low - mod NP, low - mod AP
		Redbed shales	Mod NP
		Arkose	Low NP
		Calcareous sandstone	Low NP
		Quartzose sandstone	Low NP
Igneous	Intrusive	Carbonatite	High NP, Mod AP
		Ultramafic	Mod – high NP, mod AP
		Granite	Low NP
	Volcanic	Komatiite	Mod – high NP, some AP
		Basalt	Low – mod NP
		Andesite	Low – mod NP
		Poorly welded volcanic tuff	Mod – high NP
		Highly welded volcanic tuff	Low – mod NP
		Rhyolite flows	Low – mod NP
Metamorphic		Marble	High NP
		Gneiss	Low NP
		Quartzite	Very low NP
		Sulfidic schists	Low NP, high AP

Source: Plumlee, 1999.

Table 5.3 presents the mineralization/ore classifications for the 71 NEPA mines in the study. For mines with multiple EISs or EAs, the highest individual score was used.

Table 5.3. Mineral/Ore Associations

0		1		2		3		4		5	
No/insufficient information available		Low sulfide content, carbonate present or hosted in carbonate		Low sulfide content, low carbonate content/carbonate not mentioned		Sulfides present, carbonate or mod-high NP rock present		Sulfides present, no carbonates/carbonates not mentioned or associated with ore body.		High sulfide content, carbonates low/not present	
Fort Knox	AK	Cortez Pipeline	NV	Kensington Project	AK	AJ Project	AK	Bagdad	AZ	Montana Tunnels	MT
Pogo Project	AK	Dash	NV	Sanchez	AZ	Greens Creek	AK	Safford (Dos Pobres)	AZ	Golden Sunlight	MT
True North	AK	Griffon	NV	Yarnell	AZ	Red Dog	AK	Hayden Hill	CA		
Cyprus Tohono	AZ	Jerritt Canyon	NV	American Girl	CA	Carlotta	AZ	Beartrack	ID		
Morenci	AZ	Marigold	NV	Imperial	CA	Black Pine	ID	Grouse Creek	ID		
Ray	AZ	Olinghouse	NV			Stibnite	ID	Basin Creek	MT		
Castle Mountain	CA	Rochester	NV			Thompson Creek	ID	Beal Mountain	MT		
Jamestown	CA					Diamond Hill	MT	Black Pine	MT		
McLaughlin	CA					East Boulder	MT	Mineral Hill	MT		
Mesquite	CA					Rock Creek	MT	Montanore	MT		
Royal Mountain King	CA					Stillwater	MT	Troy	MT		
Stone Cabin	ID					Battle Mountain Phoenix	NV	Zortman Landusky	MT		
Austin Gold Venture	NV					Cortez	NV	Copper Flat	NM		
Bald Mountain	NV					Florida Canyon	NV	Tyrone Little Rock	NM		
Rain	NV					Gold Quarry	NV	Mule Canyon	NV		
Gilt Edge	SD					Goldstrike	NV	Lisbon Valley	UT		
						Leeville	NV	Flambeau	WI		
						Lone Tree	NV				
						Pete	NV				
						Robinson (Ruth)	NV				
						Round Mountain	NV				
						Ruby Hill	NV				
						Trenton Canyon	NV				
						Twin Creeks	NV				
	16		7		5		24		17		2

No/Insufficient Information Available

Almost one-quarter of the mines (23% or 16 mines) did not contain sufficient information to evaluate the mineralization or ore associations. Four of the mines, Fort Knox, True North, Austin Gold Venture, and Rain, had only EAs, while two of the mines, Morenci and Ray, had EISs conducted for land exchange purposes. The McLaughlin Mine is a shallow, low-sulfidation epithermal hot-spring deposit, but insufficient information was provided in the McLaughlin EIS to categorize it.

Low Sulfide Content, Carbonate Present or Hosted in Carbonate

Ten percent (7 mines) of the NEPA mines analyzed, all located in Nevada, had rocks with low sulfide content and carbonate present or hosted in carbonate. These mines would be expected to have a relatively low impact on the environment in terms of acid-generation potential.

Low Sulfide Content, Low Carbonate Content/Carbonate Not Mentioned

Five mines (7%) also had low sulfide content but had low carbonate content, or the presence of carbonates was not mentioned. The absence of carbonate would give these mines a somewhat higher potential to generate acid than those in the previous category. Jerritt Canyon is a sediment-hosted Carlin-type deposit, but the presence of sulfides was not mentioned in the Jerritt Canyon EISs, so it was placed in the low sulfide content, carbonate present or hosted in carbonate category.

Sulfides Present, Carbonate or Moderately High Neutralizing-Potential Rock Present

The highest number of mines (24 or 34%) had both sulfides and carbonate or moderately high neutralizing potential rock present. The sulfide content at these mines was not described as "low," so the potential for acid generation is higher than the first two categories. The majority of mines in this category are in Nevada, and four of these are sediment-hosted Carlin-Type deposits (Seal and Hammarstrom, 2003). Two of the Montana mines (East Boulder and Stillwater) were placed in this category because of the presence of moderately high neutralizing potential rock (ultramafic rocks), rather than because of their carbonate content. Mines in this category have higher sulfide content than those in the previous categories but also have neutralizing rock present. The potential acid drainage potential at mines in this category will depend on the relative amounts of sulfide and neutralizing material and the proximity to one another, the availability of these minerals to weathering, the rates at which they weather, and other factors, such as climatic conditions.

Sulfides Present, No Carbonates/Carbonates Not Mentioned or Associated with Ore Body

The next category, sulfides present with no carbonate, or carbonates not mentioned or associated with the ore body, contained 17 mines (24%), and most of these mines are in Montana. The mines in this group have a relatively high potential to generate acid because of the lack of neutralizing material and the presence of sulfides.

High Sulfide Content, Carbonates Low/Not Present

Mines in the last category (2 or 3%) have the highest potential to generate acid because of the high sulfide content and the lack of or low carbonate content. Of these two mines, Golden Sunlight has had extensive problems with acid drainage (see Section 6 and Appendix B).

5.3. CLIMATE

Climate information gathered from each EIS (and/or preceding EA) included general descriptions of climate type (i.e., arid, semi arid, coastal marine, northern, etc.) and information on the amount of precipitation and evaporation.

The climate descriptions in the NEPA documents varied substantially in detail and scope of coverage (e.g., most reported the amount of precipitation, but few reported the amount of evaporation). Descriptions in the documents included "arid" (14 mines), "semi-arid" (25 mines) and "long winter" (three mines). Other descriptions particular to individual mines included "coastal marine," "continental highlands," "high desert," "modified continental," "mountain," "pacific maritime," "southern," and "temperate."

Precipitation in terms of annual moisture was reported relatively consistently in every EIS analyzed. It was generally provided in terms of a range of average annual precipitation calculated as rainfall. As noted above, evaporation data were provided sporadically, with some EISs providing an annual figure or range and with others only saying "evaporation exceeds precipitation."

In addition to recording the climate descriptions noted in the EISs, the Köppen system was used to characterize climate at each mine site. The Köppen system, developed by German climatologist and amateur botanist Wladimir Köppen in 1928, is a universally used system that allows for comprehensive and comprehensible climate classification. Köppen's system has been widely modified, with Trewartha's modified Köppen system being the most widely used version today.

The modified Köppen system uses letters to denote the six major climate regions and their sub-classifications. The sub-classifications are based on average monthly temperature and precipitation values. The regions and subclassifications are as follows:

Major Climate Regions

A for tropical humid climates
B for hot dry climates
C for mild mid-latitude climates
D for cold mid-latitude climates
E for polar climates
H for highland climates

Subtypes for Precipitation

s – dry season in summer, where: when 70% or more of annual precipitation falls in winter (for C climates)
w – dry season in winter, where: when 70% or more of annual precipitation falls in summer (for A, C, or D climates)
f – constantly moist, or: rainfall consistent throughout year (for A, C, or D climates)
m – monsoon rain, short dry season

Subtypes for Temperature

a - warmest month above or equal to 22°C
b – warmest month below 22°C (for C or D climates)
c – less than four months over 10°C (for C or D climates)
d – same as 'c' but coldest month below -37°C (for D climates)
h – hot and dry: all months above 0°C (for B climates)
k – cool and dry; at least one month below 0°C (for B climates)

Köppen classification maps were obtained for the states in which the 71 major NEPA mines analyzed were located, and mine locations were matched with climate classifications. Based on that information, the following climate classifications shown in Table 5.4 were derived for the 71 NEPA mines analyzed. It was possible to locate all 71 mines on the classification maps, so Köppen classifications are available for all the NEPA mines, even if details of the climatic conditions were not described in the EISs. Because the Köppen classification is characterized by its location

on the maps and the same Köppen score was used for each EIS, concatenating scores from multiple EISs were not necessary.

Dry/Arid Low and Middle Latitude Deserts (B/C,w,h/k)

Regions classified as *B* with precipitation subtype w and temperature subtypes *h/k* are typified by the low latitude Sonoran desert of New Mexico and Arizona and the Mohave Desert of Arizona and California. Fourteen mines in those states fell into this classification, including all the mines reviewed in New Mexico, Arizona and southern California.

Dry/Semi-Arid Middle Latitude Climates (B/D,s,a)

Regions classified as *B/D* with precipitation subtype *s* and temperature subtype *a* are typified by the higher elevation mid-latitude valley and range deserts of Nevada and Utah. Twenty-four mines in those states fell into this classification, including all the mines reviewed in Nevada and Utah. Depending on elevation, the amount of precipitation and evaporation can vary significantly from site to site in this region.

Humid Subtropical (C,s,a)

Regions classified as *C* with precipitation subtype s and temperature subtype *a* are humid subtropical regions ("Mediterranean" climates) typified by the central and coastal areas of California. Three mines located in central California were reviewed in this classification.

Marine West Coast (C,f,b)

Regions classified as *C* with precipitation subtype *f* and temperature subtype *b* are marine west coast climates typified by mild but wet weather typified by the southern Alaska coast. Three of the six mines located in Alaska fell into this classification.

Boreal Forest (D,s,a)

Although some ecologists or foresters do not consider any forests in the United States to be "boreal," the Köppen classification recognizes this as a region in the United States. Regions classified as *D* with precipitation subtype *s* and temperature subtype *a* have moist, severe (cold) winter climates and cool summers typified by inland Boreal Forests. Nineteen mines in the states of Idaho and Montana and one in Northern California (20 total) fell into this classification (including all the mines reviewed in Idaho and Montana).

Continental (D,f,a)

Regions classified as *D* with precipitation subtype *f* and temperature subtype *a* have temperate climates with humid hot summers and year-round precipitation typified by the mid-western United States. Two mines located in South Dakota and Wisconsin fell into this classification.

Sub-Arctic (D,f,c)

Regions classified as *D* with precipitation subtype *f* and temperature subtype *c* have year-round precipitation and cool summers typified by the mainland of Alaska. Three mines located in Alaska were reviewed from this classification.

Table 5.4. Koppen Climate Classification

B/C,w,h/k)		B/D,s,a		C,s,a		C,f,b		D,s,a		D,f,a		D,f,c	
Dry/Arid Low and Middle Latitude Deserts		Dry/Semi-Arid Middle Latitude Climates		Humid Tropical		Marine West Coast		Boreal Forest		Continental		Sub Arctic	
Bagdad	AZ	Austin Gold Venture	NV	Royal Mountain King	CA	AJ Project	AK	East Boulder	MT	Gilt Edge	SD	Fort Knox	AK
Carlotta	AZ	Bald Mountain	NV	Jamestown	CA	Greens Creek	AK	Montana Tunnels	MT	Flambeau	WI	Pogo Project	AK
Cyprus Tohono	AZ	Battle Mountain Phoenix	NV	McLaughlin	CA	Kensington Project	AK	Beartrack	ID			True North	AK
Morenci	AZ	Cortez	NV			Red Dog	AK	Troy	MT				
Ray	AZ	Cortez Pipeline	NV					Montanore	MT				
Safford (Dos Pobres)	AZ	Dash	NV					Diamond Hill	MT				
Sanchez	AZ	Florida Canyon	NV					Basin Creek	MT				
Yarnell	AZ	Gold Quarry	NV					Hayden Hill	CA				
American Girl	CA	Goldstrike	NV					Black Pine	ID				
Castle Mountain	CA	Griffon	NV					Grouse Creek	ID				
Imperial	CA	Jerritt Canyon	NV					Stibnite	ID				
Mesquite	CA	Leeville	NV					Stone Cabin	ID				
Copper Flat	NM	Lone Tree	NV					Thompson Creek	ID				
Tyrone Little Rock	NM	Marigold	NV					Beal Mountain	MT				
		Mule Canyon	NV					Black Pine	MT				
		Olinghouse	NV					Golden Sunlight	MT				
		Pete	NV					Mineral Hill	MT				
		Rain	NV					Rock Creek	MT				
		Robinson (Ruth)	NV					Stillwater	MT				
		Rochester	NV					Zortman Landusky	MT				
		Round Mountain	NV										
		Ruby Hill	NV										
		Trenton Canyon	NV										
		Twin Creeks	NV										
		Lisbon Valley	UT										
	14		25		3		4		20		2		3

5.4. HYDROLOGY

Hydrology information gathered from each EIS (and/or preceding EA) included information on surface water proximity and groundwater depth. Descriptions varied widely from document to document, although most contained some information on both surface water proximity and groundwater depth.

5.4.1. SURFACE WATER PROXIMITY

Information on surface water proximity was entered into the database and classified according to one of four categories:

- No information provided (0)
- Intermittent/ephemeral streams on site - perennial streams >1 mile away (1)
- Intermittent/ephemeral streams on site - perennial streams <1 mile away (2)
- Perennial streams on site (3)

An intermittent stream is one that flows only during wet periods that are not tied to short-term storm events, for example, when it receives water from springs or melting snow. Ephemeral streams are those that flow only in response to precipitation and whose channel is always above the water table. Most desert drainages are ephemeral. In most cases, the streams were not identified as one or the other in the NEPA documents, so no distinction was made between these two types of non-perennial streams. Generally, mines with perennial streams on site are more susceptible to surface water quality impacts from mining than those with only intermittent or ephemeral streams on site.

For mines with multiple EISs or EAs, the highest individual score was used. If there are only intermittent or ephemeral streams on site but no distance to perennial surface water is noted, it was scored as a 2 (perennial streams <1 mile away). Direct discharges to surface water, including NPDES permits, are discussed in Section 5.1. Results for the surface water hydrology classifications are presented in Table 5.5.

No Information Provided

Five mines (7%) reviewed did not provide information on the proximity to surface water resources. In some cases, maps may have been included in the EIS, but insufficient information was provided on the maps (e.g., whether or not streams were perennial) to make a supportable classification. Of these five mines, one (Rain) had only an EA.

Intermittent/Ephemeral Streams on Site - Perennial Streams >1 Mile Away

Nineteen mines (27%) were classified as having intermittent and/or ephemeral streams on site and perennial streams greater than one mile away. This classification could also be summarized as "far from surface water." The mines in this category were located in the southwestern states of New Mexico and Arizona and in California, Idaho, Nevada, and Utah.

Intermittent/Ephemeral Streams on Site - Perennial Streams <1 Mile Away

Sixteen mines (23%) were classified as having intermittent and/or ephemeral streams on site and perennial streams less than one mile away. This classification could also be summarized as "moderately far from surface water." The mines in this category were located in Alaska, California, Montana, Nevada, and Wisconsin.

Perennial Streams on Site

The highest number of mines (31 or 44%) was classified as having perennial streams on site. This classification could also be summarized as "close to surface water." The mines in this category are located in Alaska, Arizona, California, Idaho, Montana, New Mexico, Nevada and South Dakota.

Table 5.5. Surface Water Proximity

0		1		2		3	
No information		Intermittent/ ephemeral streams on site - perennial streams >1 mile away		Intermittent/ ephemeral streams on site - perennial streams <1 mile away		Perennial streams on site	
Yarnell	AZ	Bagdad*	AZ	True North	AK	AJ Project	AK
Imperial	CA	Cyprus Tohono	AZ	McLaughlin*	CA	Fort Knox	AK
Royal Mountain King*	CA	Safford (Dos Pobres)	AZ	Golden Sunlight*	MT	Greens Creek *	AK
Diamond Hill	MT	Sanchez	AZ	Montana Tunnels	MT	Kensington Project	AK
Rain	NV	American Girl*	CA	Stillwater*	MT	Pogo Project	AK
		Castle Mountain*	CA	Austin Gold Venture	NV	Red Dog	AK
		Mesquite*	CA	Battle Mountain Phoenix	NV	Carlotta	AZ
		Black Pine	ID	Goldstrike	NV	Morenci	AZ
		Copper Flat	NM	Leeville	NV	Ray*	AZ
		Bald Mountain	NV	Marigold	NV	Hayden Hill	CA
		Cortez	NV	Pete	NV	Jamestown*	CA
		Cortez Pipeline	NV	Robinson (Ruth)	NV	Beartrack	ID
		Florida Canyon*	NV	Rochester*	NV	Grouse Creek*	ID
		Gold Quarry	NV	Round Mountain*	NV	Stibnite	ID
		Griffon	NV	Ruby Hill*	NV	Stone Cabin	ID
		Lone Tree*	NV	Flambeau*	WI	Thompson Creek*	ID
		Mule Canyon	NV			Basin Creek	MT
		Olinghouse	NV			Beal Mountain*	MT
		Lisbon Valley	UT			Black Pine*	MT
						East Boulder	MT
						Mineral Hill*	MT
						Montanore	MT
						Rock Creek	MT
						Troy	MT
						Zortman and Landusky*	MT
						Tyrone Little Rock	NM
						Dash	NV
						Jerritt Canyon*	NV
						Trenton Canyon	NV
						Twin Creeks*	NV
						Gilt Edge	SD
	5		19		16		31

Note: In Tables 5.5 through 5.22, the 25 mines chosen as case study mines are indicated by an asterisk (*).

5.4.2. DEPTH TO GROUNDWATER

Information on the depth to groundwater was entered into the database and classified according to one of four categories:

- No information provided (0)
- Depth to groundwater > 200 feet (1)
- Depth to groundwater < 200 but >50 feet (2)
- Depth to groundwater 0 to 50 feet and/or springs on site (3)

Table 5.6 contains the results of the scoring of the 71 NEPA mines for depth to groundwater. For mines with multiple EISs or EAs, the individual highest score was used. The shallowest depth to groundwater was used, even if the groundwater was described as being "perched," or if the groundwater was alluvial. If springs were noted on the site but there was no other information about the depth to groundwater, it was scored as a 3. Therefore, springs were considered an expression of groundwater rather than as surface water. In general, mines with shallower depths to groundwater are more susceptible to groundwater quality impacts than those with greater depths to groundwater.

No Information Provided

NEPA documentation from eight mines (11%) did not provide any information on the depth to groundwater. Two of these mines (True North, AK; Austin Gold Venture, NV) had only EAs.

Depth to Groundwater > 200 feet

Twelve mines (17%) were classified as having a depth to groundwater of greater than 200 feet. The mines in this category are considered to be far from groundwater resources and are located in Arizona, California, Montana and Nevada.

Depth to Groundwater < 200 but > than 50 feet

Nine mines (13%) were classified as having a depth to groundwater of less than 200 but greater than 50 feet. The mines with this classification are located in Arizona, California, Idaho, Montana and Nevada and Utah.

Depth to Groundwater Less Than 50 feet and/or Springs on Site

The largest number of mines (42 or 59%) was classified as having a depth to groundwater of less than 50 feet and/or having springs on site. The mines with this classification are located in Alaska, Arizona, California, Idaho, Montana, Nevada, South Dakota and Wisconsin.

Table 5.6. Depth to Groundwater.

0		1		2		3	
No information		Depth to groundwater >200 feet		Depth to groundwater <200 but >50 feet		Depth to groundwater 0 to 50 ft or springs on site with no other info	
AJ Project	AK	Ray*	AZ	Cyprus Tohono	AZ	Fort Knox	AK
True North	AK	Castle Mountain*	CA	Mesquite*	CA	Greens Creek*	AK
Carlotta	AZ	Montanore	MT	Black Pine	ID	Kensington Project	AK
Imperial	CA	Bald Mountain	NV	Mineral Hill*	MT	Pogo Project	AK
Royal Mountain King*	CA	Cortez Pipeline	NV	Marigold	NV	Red Dog	AK
Copper Flat	NM	Griffon	NV	Pete	NV	Bagdad*	AZ
Tyrone Little Rock	NM	Leeville	NV	Round Mountain*	NV	Morenci	AZ
Austin Gold Venture	NV	Mule Canyon	NV	Twin Creeks*	NV	Safford (Dos Pobres)	AZ
		Olinghouse	NV	Lisbon Valley	UT	Sanchez	AZ
		Rain	NV			Yarnell	AZ
		Ruby Hill*	NV			American Girl*	CA
		Trenton Canyon	NV			Hayden Hill	CA
						Jamestown*	CA
						McLaughlin*	CA
						Beartrack	ID
						Grouse Creek*	ID
						Stibnite	ID
						Stone Cabin	ID
						Thompson Creek*	ID
						Basin Creek	MT
						Beal Mountain*	MT
						Black Pine*	MT
						Diamond Hill	MT
						East Boulder	MT
						Golden Sunlight*	MT
						Montana Tunnels	MT
						Rock Creek	MT
						Stillwater*	MT
						Troy	MT
						Zortman and Landusky*	MT
						Battle Mountain Phoenix	NV
						Cortez	NV
						Dash	NV
						Florida Canyon*	NV
						Gold Quarry	NV
						Goldstrike	NV
						Jerritt Canyon*	NV
						Lone Tree*	NV
						Robinson (Ruth)	NV
						Rochester*	NV
						Gilt Edge	SD
						Flambeau*	WI
	8		12		9		42

5.5. GEOCHEMICAL CHARACTERIZATION AND MODELING

5.5.1. TESTING METHODS

Information was gathered from each EIS (and/or preceding EA) on the types of laboratory and field geochemical testing methods used to characterize the potential of the project to generate acid and leach contaminants of concern. The general methods listed included:

- whole rock analysis
- mineralogy
- paste pH
- sulfur analysis
- static testing
- short-term leach testing
- kinetic testing
- other additional tests

A number of the methods have sub-categories; for example, types of short-term leach testing methods include the Nevada Meteoric Water Mobility Procedure (MWMP), U.S. EPA's Synthetic Precipitation Leaching Procedure (SPLP), and the California Waste Extraction Test (CA WET). A review of the different types of geochemical characterization methods is contained in the companion report to this document (Maest et al., 2005). It is possible that additional geochemical characterization methods were performed but not mentioned in the NEPA documents. For example, although sulfur analysis was not specifically mentioned, it may have been conducted as part of the acid-base accounting evaluation. Similarly, mineralogical analysis may have been conducted as part of evaluating the ore body, but the results may not have been presented in the NEPA documents.

The scoring for this category focused on the main types of geochemical characterization tests used: static, short-term leach, and kinetic testing, and were scored at follows:

- No information (0)
- Static testing only (1)
- Short-term leach testing only (2)
- Kinetic testing only (3)
- Static and short-term leach testing (4)
- Static and kinetic testing (5)
- Short-term leach and kinetic testing (6)
- Static, short-term leach, and kinetic testing (7)

Tests identified as "weather" or "weathering" were assumed to be kinetic tests, and column or barrel testing for heap detoxification was also considered to be kinetic testing. For mines with multiple EISs, the EIS with the most types of testing (highest score) was recorded. Table 5.7 lists the types and combinations of types of geochemical characterization tests that were mentioned for the 71 NEPA mines with EISs and EAs that were reviewed.

Table 5.7. Geochemical Characterization

0		1		2		3		4		5		6		7	
No lab/field predictive testing conducted/type unknown		Static testing only		Short-term leach testing only		Kinetic testing only		Static and short-term leach testing conducted		Static and kinetic testing conducted		Short-term leach and kinetic testing		Static, short-term leach, and kinetic testing conducted	
AJ Project	AK	True North	AK	Carlotta	AZ	Basin Creek	MT	Safford (Dos Pobres)	AZ	Fort Knox	AK	Mineral Hill*	MT	Greens Creek*	AK
Red Dog	AK	Bagdad*	AZ	Imperial*	CA			Sanchez	AZ	Pogo Project	AK			Kensington Project	AK
Morenci	AZ	Cyprus Tohono	AZ	Jamestown*	CA			American Girl*	CA	Mesquite*	CA			Yarnell	AZ
Ray*	AZ	Royal Mountain King*	CA	Austin Gold Venture	NV			Castle Mountain*	CA	Stibnite	ID			Hayden Hill	CA
Black Pine	MT	Montana Tunnels	MT					McLaughlin*	CA	Stone Cabin	ID			Beartrack	ID
East Boulder	MT	Montanore	MT					Black Pine	ID	Diamond Hill	MT			Thompson Creek*	ID
Troy	MT	Tyrone Little Rock	NM					Grouse Creek*	ID	Rock Creek	MT			Beal Mountain*	MT
Rain	NV	Cortez	NV					Bald Mountain	NV	Copper Flat	NM			Golden Sunlight*	MT
		Mule Canyon	NV					Griffon	NV	Dash	NV			Stillwater*	MT
		Pete	NV					Leeville	NV	Gold Quarry	NV			Zortman Landusky*	MT
								Trenton Canyon	NV	Goldstrike	NV			Battle Mountain Phoenix	NV
								Lisbon Valley	UT					Cortez Pipeline	NV
														Florida Canyon*	NV
														Jerritt Canyon*	NV
														Lone Tree*	NV
														Marigold	NV
														Mule Canyon	NV
														Olinghouse	NV
														Robinson (Ruth)	NV
														Rochester*	NV
														Round Mountain*	NV
														Ruby Hill*	NV
														Twin Creeks*	NV
														Gilt Edge	SD
														Flambeau*	WI
	8		9		4		1		12		11		1		25

No Information Provided

Eleven percent of the mines (8) either did not perform geochemical characterization, did not mention that they performed testing, or did not mention the type of testing performed. Of these, two had land-exchange EISs (Morenci and Ray, AZ), and one had an EA (Rain, NV).

Static Acid-Base Accounting (ABA) Testing Only

Nine mines (13%) performed static testing only. Three of these mines (True North, AK; Royal Mountain King, CA; Pete, NV) had EAs. (The 1987 document for Royal Mountain King was an EIR/EA). The remaining six mines had EISs, and two of these were in Arizona, two in Montana, one in New Mexico, and one in Nevada. Eight of the mines mentioned acid-base accounting testing with no mention of the type of ABA testing performed, and one, (Pete, NV), owned by Newmont, used net carbonate value testing (NCV), a method developed by Newmont.

Short-term Leach Testing Only

Four mines (6%) conducted only short-term leach testing. One (Austin Gold Venture, NV), was permitted with a 1986 EA; no mention of the type of short-term leach testing was made for this mine. Of the other three mines, two were in California and one was in Arizona. The Carlotta Mine in Arizona used the meteoric water mobility procedure (MWMP) test devised by the State of Nevada; the Jamestown Mine in California used the California waste extraction test (WET); and the Imperial Mine in southern California used three EPA short-term leach methods, the Extraction Procedure (EP) Toxicity test (Method 1310), the Synthetic Precipitation Leaching Procedure (SPLP – Method 1312), and the Multiple Extraction Procedure (MEP – Method 1320). Information on the details of these methods is contained in Maest et al. (2005).

Kinetic Testing Only

One mine (1%)(Basin Creek Mine, MT) conducted only kinetic testing. The kinetic method used was column testing of the spent ore for heap cyanide detoxification (rinsing with the heap with hydrogen peroxide to break down cyanide). This method is not traditionally considered to be kinetic testing (as humidity cell testing is), but it does test behavior of mined material over a longer time period and is therefore categorized as kinetic testing for the purposes of this study.

Static and Short-term Leach Testing

Twelve mines (17%) performed both static testing and short-term leach testing. All of these mines had EISs rather than EAs. Ten of the mines identified the static testing only as acid-base accounting testing. The McLaughlin Mine in California employed a static acid-base accounting test that used hydrogen peroxide, similar to the net acid generating (NAG) test used more commonly in Australia and Southeast Asia. The Leeville Mine in Nevada, owned by Newmont, used the net carbonate value (NCV) acid-base accounting test.

Five of the mines that used both static and short-term leach testing used the synthetic precipitation leaching procedure (SPLP, EPA Method 1312), two of the mines (American Girl and McLaughlin) used the California waste extraction procedure (CA WET), four of the mines (all in Nevada) used the meteoric water mobility procedure (MWMP), one used the extraction procedure (EP) toxicity test, and one had no information on the type of short-term leach testing employed. See Maest et al. (2005) for a review of the testing procedures and their advantages and disadvantages. Two mines (American Girl and McLaughlin) performed two types of short-term leach testing, CA WET and SPLP and deionized water extraction and CA WET, respectively.

Static and Kinetic Testing

Eleven mines (16%) performed both static testing and kinetic testing. Only one of these mines, (Fort Knox, AK) had an EA; all others had EISs. For the static testing, nine of the mines mentioned only acid-base accounting testing, one did not mention the type of static testing used, and one (Gold Quarry/Maggie Creek, NV), owned by Newmont, used the NCV method.

For the kinetic testing, five mines used humidity cell tests (HCT), five used column tests, one used "weathering tests," and three did not provide any information on the type of kinetic testing used (two mines used two types of kinetic testing).

Short-term Leach and Kinetic Testing

One mine (1%), (Mineral Hill Mine, MT) conducted both short-term leach and kinetic testing. Batch extraction and column tests were used at this mine.

Static, Short-term Leach, and Kinetic Testing

Twenty-five mines (35%) conducted static, short-term leach and kinetic testing. All these mines had EISs rather than EAs. Thirteen of the mines were in Nevada, four in Montana, two in Alaska, two in Idaho, and one each in California, South Dakota and Wisconsin. For static testing, the Greens Creek Mine in Alaska used the BC Research (modified) test; the Beal Mountain Mine in Montana mentioned using the modified Sobek method; and the Golden Sunlight Mine in Montana and the Marigold and Robinson (Ruth) mines in Nevada mentioned using the NAG test. None of the other mines specified which type of ABA testing was used.

For the short-term leach testing, ten of the mines (all in Nevada) used the MWMP test; seven of the mines used the SPLP test; two used the TCLP test; two used the EP Toxicity test, one used the soluble/total threshold limit test; one used the shake flask test; one used sequential saturated rolling extractions; and two had no information on the type of short-term leach test used. Some of the mines used multiple types of short-term leach methods.

For the kinetic testing, 18 mines used humidity cell tests, six used column tests, and four provided no information on the type of kinetic testing used. Some mines used multiple types of kinetic testing, all including HCT and "weathering," field extractions or column tests.

Static Testing – Overall Summary

Eighty percent of the mines (56) reported conducting some kind of static testing. A wide variety of static test methods were identified. Forty-eight of the mines (69%) did not specify the type of static testing or listed acid-base accounting (ABA) without listing the type of ABA method used (e.g., Sobek, modified Sobek – see Maest, et al., 2005). One mine (Beal Mountain, MT) mentioned using the modified Sobek method, and one mine (Greens Creek, AK) mentioned using the modified BC Research technique. Four of the mines that conducted static testing mentioned using the net acid generating (NAG) technique or a technique similar to the NAG method. Three of the mines (Gold Quarry, Leeville, Pete, NV), all owned by Newmont, mentioned using the net carbonate value (NCV) approach.

Short-term Leach Tests – Overall Summary

Short-term leach test methods were identified at 41 (59%) of the 71 mines. Five of the mines (7%) did not specify which type of short-term leaching method they used. Two of the mines (Jamestown and McLaughlin, CA) used the California waste extraction test; four of the mines used the older EP Toxicity test (EPA Method 1310); two of the mines used the Toxicity Characteristic Leaching Procedure (TCLP, EPA Method 1311), and 12 of the mines (17%) used the Synthetic Precipitation Leaching Procedure (SPLP, EPA Method 1312). Fifteen of the mines (21%) (14 in Nevada; Carlotta, AZ) used the Nevada MWMP.

Kinetic Testing – Overall Summary

Kinetic testing was identified at 38 (54%) of the 71 NEPA mines. Of the mines that reported conducting kinetic testing, the most common method was humidity cell testing (23 or 33%). Eight of the mines (11%) did not specify the type of kinetic testing conducted, and thirteen (19%) of the mines reported conducting column tests. Descriptions of the kinetic tests varied and included 10- week, 15- week and 21- to -39- week humidity cell tests;, column leach tests;, laboratory weathering testes, and long-term field leaching extract tests.

Slightly fewer than half (31) of the mines (44%) therefore, did not conduct any long-term testing of mined materials, and 38 mines (54%) did conduct kinetic testing to estimate the long-term environmental behavior of mined materials. A number of the mines that conducted kinetic testing only reported pH and/or pH and sulfate measurements for their kinetic testing results. Therefore, very few mines reported on the long-term potential for contaminant leaching, other than for acidity and sulfate generation.

Other Types of Geochemical Characterization

Sulfur Analysis

Of the mines that did report conducting sulfur analyses (16 or 23%), two did not mention the type of sulfur analysis performed, five (31%) conducted only total sulfur analysis, six (38%) reported total and sulfide or pyritic sulfur analysis, and three (19%) conducted the most thorough possible analysis: total sulfur and sulfur fractions (potentially including total, sulfate, organic, pyritic and sulfide sulfur forms).

Additional Tests

Additional types of geochemical characterization tests that were identified in the EISs included barrel or other types of tests to simulate heap rinsing, trace element analysis, petrographic analysis, infiltration tests conducted on waste rock piles, and studies on mixing acid leachate with groundwater.

5.5.2. CONSTITUENTS OF CONCERN IDENTIFIED

Constituents of concern (COCs) were identified in the EISs directly (specifically called constituents of concern or contaminants of concern) or indirectly (e.g., as constituents that were present at elevated levels in leachate or as analytes in required monitoring programs). Table 5.8 lists the identified constituents of concern for the 71 mines. The general categories of constituents of concern and specific examples cited in the EISs were:

- metals (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, thallium, tin, zinc)
- radionuclides (radium, uranium)
- anions and nitrogen compounds (sulfate, nitrate/nitrite/ammonia (from blasting), fluoride)
- cyanide (cyanide and compounds)
- metalloids, oxyanions (antimony, arsenic, molybdenum, selenium, tungsten, vanadium)
- conventional pollutants (total dissolved solids, total suspended solids, pH, organics, nutrients (e.g., phosphate or nitrogen compounds not resulting from blasting), sediment, salts (e.g., chloride, sodium), turbidity, oil and grease)

Because a given mine often had more than one constituent of concern (e.g., metals and anions and cyanide), the percentage of mines with COCs in all the above categories sums to more than 100%. For mines with multiple EISs or EAs, if a COC was mentioned in any of the EISs, it was included as a COC for the mine as a whole.

Table 5.8 shows that 11 of the 71 mines (16%) had no information or insufficient information on constituents of concern. The largest number of mines, 51 (74%) identified metals as COCs, while nearly equal numbers of mines

identified anions and nitrogen compounds, metalloids and oxyanions, and conventional pollutants as COCs (ranging from 49% to 58%). Only 16 of the mines (23%) identified cyanide as a constituent of concern; this number does not include all heap leach and vat leach precious metals operations – only the ones that specifically identified cyanide as a constituent of concern. Only one mine (Lisbon Valley Copper, UT) identified radionuclides (uranium and radium) as a constituent of concern.

Table 5.8. Identified Constituents of Concern

Score	Category	Number in category	Percent
0	None/insufficient information	11	15.9%
1	Metals	51	73.9%
2	Radionuclides	1	1.4%
3	Anions and nitrogen compounds	40	58.0%
4	Cyanide	16	23.2%
5	Metalloids, oxyanions	38	55.1%
6	Conventional pollutants	34	49.3%

The most commonly identified metals of concern were cadmium (24 mines), copper (29 mines), lead (20 mines), iron and manganese (22 mines each) and zinc (28 mines). Mercury was identified as a COC in sixteen mines. The most commonly identified metalloid of concern was arsenic (28 mines). Selenium (15 mines) and antimony (11 mines) were also mentioned as metalloid COCs at a number of mines. The most commonly identified anions of concern were sulfate (26 mines) and nitrate (16 mines). The most commonly mentioned conventional pollutants were total dissolved solids (19 mines) and pH (15 mines). Four mines mentioned elevated or high pH as a potential concern (Bear Track, ID; Copper Flat, NM; Marigold, NV; Lisbon Valley Copper, UT).

5.5.3. PREDICTIVE MODELS USED

The EISs and EAs from the 71 NEPA mines were reviewed to determine whether water quantity or water quality predictive models were used, and if so, what types of predictive model or models were used. The information on general types of predictive models used was classified and scored according to one of four categories:

- No predictive models used (0)
- Only water quantity predictive models used (1)
- Only water quality predictive models used (2)
- Both water quantity and water quality predictive models used (3).

For mines with multiple EISs, if a predictive model was used in any of the EISs, it was included for the mine as a whole. Table 5.9 lists the general types of predictive models used at the 71 NEPA mines.

No Predictive Models Used

No predictive models were used at 31 (44%) of the 71 NEPA mines. Eight of these mines were in Montana, seven in Nevada, five in Arizona, four in California, four in Alaska, one in Idaho, and one in New Mexico. Of these, seven had EAs, and the remainder had EISs.

Only Water Quantity Predictive Models Used

Of the mines that did report using predictive models, water quantity only (not combined with water quality models) predictive models were identified as being used at 18 (25%) of the mines. The water quantity models included surface transport models (SEDCAD), groundwater modeling (FLOWPATH) and infiltration modeling (HELP). The

Table 5.9. Predictive Models Used

0		1		2		3	
No predictive models used		Water quantity predictive model only		Water quality predictive model only		Water quality and quantity predictive models used	
AJ Project	AK	Sanchez	AZ	Flambeau*	WI	Greens Creek *	AK
Fort Knox	AK	Yarnell	AZ			Pogo Project	AK
Kensington Project	AK	American Girl*	CA			Safford (Dos Pobres)	AZ
Red Dog	AK	Hayden Hill	CA			Mesquite*	CA
True North	AK	Imperial	CA			Thompson Creek*	ID
Bagdad*	AZ	Beartrack	ID			Golden Sunlight*	MT
Carlotta	AZ	Grouse Creek*	ID			Montanore	MT
Cyprus Tohono	AZ	Stibnite	ID			Tyrone Little Rock	NM
Morenci	AZ	Stone Cabin	ID			Battle Mountain Phoenix	NV
Ray*	AZ	Mineral Hill*	MT			Cortez Pipeline	NV
Castle Mountain*	CA	Stillwater*	MT			Gold Quarry	NV
Jamestown*	CA	Zortman and Landusky*	MT			Goldstrike	NV
McLaughlin*	CA	Bald Mountain	NV			Lone Tree*	NV
Royal Mountain King*	CA	Dash	NV			Marigold	NV
Black Pine	ID	Florida Canyon*	NV			Mule Canyon	NV
Basin Creek	MT	Griffon	NV			Olinghouse	NV
Beal Mountain*	MT	Leeville	NV			Robinson (Ruth)	NV
Black Pine*	MT	Lisbon Valley	UT			Round Mountain*	NV
Diamond Hill	MT					Ruby Hill*	NV
East Boulder	MT					Twin Creeks*	NV
Montana Tunnels	MT					Gilt Edge	SD
Rock Creek	MT						
Troy	MT						
Copper Flat	NM						
Austin Gold Venture	NV						
Cortez	NV						
Jerritt Canyon*	NV						
Pete	NV						
Rain	NV						
Rochester*	NV						
Trenton Canyon	NV						
	31		18		1		21

types of water quantity codes used included: the near-surface-process hydrologic process codes HEC-1 and HELP (used at four of the mines) for infiltration, evaporation, and runoff; the codes SEDCAD (used at three of the mines), MUSLE, RUSTLE, and R1/R4SED for predicting sediment movement or effects of sedimentation on streams; a code for developing storm hydrographs (WASHMO); groundwater flow models (MODFLOW - reported being used at two of the sites); vadose zone models (HYDRUS) and drawdown models (at two mines). One mine, (Lone Tree, NV) used the propriety code MINEDW to predict 3-dimensional groundwater flow. See Maest et al. (2005) for a review of these models.

Only Water Quality Predictive Models Used

One mine (Flambeau Mine, WI) used a geochemical model only (not in combination with a water quantity model) to predict the concentration of contaminants in leachate in the backfilled pit.

Both Water Quantity and Water Quality Predictive Models Used

Twenty-one (30%) of the mines used a combination of water quantity and water quality models to predict water quality impacts after mining began. Of these, some mines used a water quantity code in combination with the geochemical codes PHREEQE (3 mines), WATEQ (1 mine), or MINTEQ (five mines), or PYROX or other type of pyrite oxidation code (3 mines). One mine used the code LEACHM to simulate water balance and contaminant transport. Three mines in Nevada used the CE-QUAL-W2 to simulate pit water flow and limited water quality characteristics and one mine used CE-Qual-R1. Four mines used unspecified mass balance or mass loading modeling (and the Tyrone/Little Rock Mine in New Mexico specifically mentioned using FLOWPATH), and five mines used proprietary models to predict pit water concentrations or groundwater concentrations downgradient of a waste rock facility.

5.6. WATER QUALITY IMPACT POTENTIAL

In this report we distinguish between potential and predicted water quality impacts. A potential water quality impact is one that could occur if mitigation are not in place, and predicted water quality impacts are those that threaten water quality even after mitigation are in place. Potential water quality impacts are related to the inherent characteristics of the mined materials. For example, tailings could have a potential to impact downgradient water quality if they have elevated acid drainage potential or contaminant leaching potential. However, if the tailings are in a properly lined facility with a backup capture system or are backfilled as a paste in underground workings or a tailings impoundment, their predicted water quality impacts could be low.

The elements of water quality impact potential include acid drainage potential, contaminant leaching potential, and potential groundwater, surface water and pit water impacts.

5.6.1. ACID DRAINAGE POTENTIAL

Information on acid drainage potential was based on static testing results, sulfur or pyrite contents or simply on statements in the EIS or EA that described the acid drainage potential as "low," "moderate," or "high" or that the material does or does not have the potential to produce acid. Identification of existing acid drainage was reported in some cases, but more importance was placed on the potential for acid drainage for the proposed project that was the subject of the EIS or EA.

The information on acid drainage potential contained in the EISs was summarized and scored as follows:

- No information available (0)
- Low acid drainage potential (1)
- Moderate acid drainage potential (2)
- High acid drainage potential (3)

Table 5.10 contains the names of the mines in the four categories for acid drainage potential. The recorded potential for acid drainage is for unit/material with the greatest potential to produce acid. If the EIS statement was somewhat negative (e.g., the potential for acid drainage exists), the entry was scored as a 2 (moderate potential to generate acid).

For mines with multiple EISs, the EIS with the highest potential to generate acid was used as the score for the mine. Mines with low acid drainage potential also include mines with material that has the potential to generate high-pH waters.

Table 5.10. Acid Drainage Potential

0		1		2		3	
No information available		Low		Moderate		High	
AJ Project	AK	Fort Knox	AK	Greens Creek*	AK	Red Dog	AK
Morenci	AZ	Kensington Project	AK	Carlotta	AZ	Black Pine*	MT
Ray*	AZ	Pogo Project	AK	Hayden Hill	CA	Golden Sunlight*	MT
Austin Gold Venture	NV	True North	AK	Grouse Creek*	ID	Zortman and Landusky*	MT
Rain	NV	Bagdad*	AZ	Stone Cabin	ID	Battle Mountain Phoenix	NV
Flambeau*	WI	Cyprus Tohono	AZ	Thompson Creek*	ID		
		Safford (Dos Pobres)	AZ	Beal Mountain*	MT		
		Sanchez	AZ	Diamond Hill	MT		
		Yarnell	AZ	Montana Tunnels	MT		
		American Girl*	CA	Montanore	MT		
		Castle Mountain*	CA	Gold Quarry	NV		
		Imperial	CA	Goldstrike	NV		
		Jamestown*	CA	Jerritt Canyon*	NV		
		McLaughlin*	CA	Leeville	NV		
		Mesquite*	CA	Lone Tree*	NV		
		Royal Mountain King*	CA	Mule Canyon	NV		
		Beartrack	ID	Pete	NV		
		Black Pine	ID	Robinson (Ruth)	NV		
		Stibnite	ID	Rochester*	NV		
		Basin Creek	MT	Twin Creeks*	NV		
		East Boulder	MT				
		Mineral Hill*	MT				
		Rock Creek	MT				
		Stillwater*	MT				
		Troy	MT				
		Copper Flat	NM				
		Tyrone Little Rock	NM				
		Bald Mountain	NV				
		Cortez	NV				
		Cortez Pipeline	NV				
		Dash	NV				
		Florida Canyon*	NV				
		Griffon	NV				
		Marigold	NV				
		Olinghouse	NV				
		Round Mountain*	NV				
		Ruby Hill*	NV				
		Trenton Canyon	NV				
		Gilt Edge	SD				
		Lisbon Valley	UT				
	6		40		20		5

Some of the conditions thought to limit the potential for acid drainage (as stated in the EISs) were: a limited amount of water or oxygen; removal of sulfide ore from the open pit; silica buffering, encapsulating of sulfides in silica; and lack of acid drainage from past mining activity at the same site. Some EISs predicted low to moderate acid drainage

potential based on the results of kinetic testing even though static testing results suggested that acid drainage could form. Finally, several mines acknowledged that acid drainage could not be accurately predicted.

No Information Available

Six mines (8%) had EISs or EAs that made no mention of acid drainage potential. Of these, two were land-exchange EISs (Morenci, Ray, AZ), and two were evaluated with EAs rather than EISs (Austin Gold Venture, Rain, NV). The EIS for the AJ Project in Alaska had no direct mention of acid drainage potential. The EIS for the Flambeau Mine in Wisconsin mentioned that tests indicated that waste rock with sulfur content of 2% or less would not be expected to produce acid, but there was no indication of the amount of high (or low) sulfur material present.

Low Acid Drainage Potential

The acid drainage potential for the majority of mines (40 or 56%) was described as being low or nonexistent. Eleven of these mines were in Nevada; seven were in California; six were in Montana; five were in Arizona; four were in Alaska; three were in Idaho; two were in New Mexico; one was in South Dakota (Gilt Edge); and one was in Utah (Lisbon Valley Copper).

EISs for four of these mines provided no information on or did not perform static or kinetic testing of mined materials. The Imperial Mine, California, EIR stated that the waste rock and leached ore had high acid neutralization potential, but no information was provided in the EIR on static or kinetic test methods or results. Similarly, the Jamestown Mine, California, EIR stated that chemical analysis of the overburden material indicated that it is non-hazardous, non-toxic, and non-acid generating, but no information was provided in the EIR on the type or results of the chemical tests. The East Boulder Mine in Montana performed no static or kinetic testing, but appears to base the low acid drainage potential on the low sulfur content. The EIS for the Troy Mine in Montana also had no information on static or kinetic tests in the EIS. This EIS is over 20 years old, and it stated that the mineralogy of the host rocks and the type of minerals being mined apparently do not produce acid mine water.

The remainder of the mines did perform some kind of static or kinetic testing, but in a number of cases, the statements about low acid drainage potential did not appear to be based on test results. For example, unsupported statements such as "not expected to generate acid" were found in EISs for True North in Alaska, Stillwater Mine in Montana (1992 EIS), and Basin Creek in Montana, and the low acid generation potential was based on the low sulfur content in the East Boulder, Montana and Fort Knox, Alaska EISs. Some mines appeared to base the prediction of low acid drainage potential at least in part on existing conditions (i.e. no observed acid drainage related to past mining activities) at the mine (e.g., Bagdad, AZ; Troy, MT; Copper Flat, NM; Kensington, AK (1992 EIS); Rock Creek, MT (1998 EIS)).

Some mines predicted that there would be moderate or high acid drainage potential based on static tests but downgraded the potential to low based on kinetic tests. For example, at the Florida Canyon Mine in Nevada, unoxidized sulfide rock was considered to have the potential to generate acid based on static testing. However, results from "reanalyzed" samples and kinetic testing indicted that the rock was not acid generating because no samples with ANP:AGP <1 had kinetic test pH values <5.75 (note that pH standards for natural waters are always >6).

The Copper Flat, New Mexico, EIS stated that ABA tests indicated that the waste rock may have the potential to generate acid, but column kinetic tests of the unoxidized rock showed little oxidation after 20 weeks. Similarly, the 2001 Marigold, Nevada, EIS stated that not all waste rock was non-acid-generating, but column kinetic testing did not generate acid in 20 weeks. In the 1997 EIS for the Kensington, Alaska, mine, static testing results on ore were in an area of uncertainty for acid generation potential (NP:AP = 1-3), but results from kinetic testing produced no acid within 20 weeks of testing. As noted in Maest et al. (2005), a number of workers consider that 20 weeks is too short of a time period for kinetic testing.

EISs for two mines in this category stated that low amounts of water would limit acid drainage (Mineral Hill, Montana (1986 EIS) and Cortez Pipeline, Nevada (2000 EIS). The 2001 Rock Creek EIS also noted that the lack of exposure of sulfides to oxygen in the underground mine would limit acid drainage.

Three mines in this category acknowledged that acid drainage could not be accurately predicted. The 1978 EIS for the Troy Mine in Montana stated that no predictive tests were available to determine whether or not the mined material would generate acid. The Lisbon Valley, Utah, Mine EIS stated that impacts to groundwater or the pit could not be predicted based on the level of testing to date. The 1995 EIS for the Rock Creek Mine in Montana EIS stated that the long-term potential for acid drainage was unknown, as static tests would not predict this with certainty, and that kinetic tests would be useful. Kinetic tests were performed on material from the nearby Troy Mine, and based on these results, subsequent EISs also predicted that acid generation potential would be low. Although uncertainty about acid generation potential is acknowledged in the 1998 Rock Creek EIS, the potential for acid drainage from the tailings was predicted to be low.

Moderate Acid Drainage Potential

The EISs for 20 mines (28%) indicated moderate acid drainage potential. The mines in this category included two in Alaska (Greens Creek and Red Dog), one in Arizona (Carlotta), one in California (Hayden Hill), three in Idaho, four in Montana, and 10 in Nevada. The Lone Tree, Nevada mine EIS identified the moderate acid drainage potential based on to static testing results but also noted that kinetic tests did not produce acid, that the sulfides are encapsulated in silica and that silica buffering is important. The Mule Canyon, NV mine EIS acknowledged the potential generation of acid if the excavated mine materials were to come in contact with water.

Two of the mines in this category (Carlotta, AZ and Thompson Creek, ID) acknowledged some potential to generate acid but also noted that removal of sulfide ore from the open pit would leave little source of acid generation in the open pits. The 1984 EIS for the Grouse Creek, Idaho, Mine stated that even though an historic mine on the property had acid drainage from a portal, conditions would be different for the proposed mine. The EIS for the Montanore Mine in Montana stated that post-mining water quality could be acidic, but that acid drainage could not be accurately predicted. The EIS for the Diamond Hill Mine in Montana stated, as did some of those mines in the low acid drainage potential category, that the dry climate, low permeability transmissivity of the country rock, the total lack of discharge from an existing adit, and the lack of seeps or springs in the area, would limit the amount of acid drainage forming at the site. Some samples from the Robinson (Ruth) Mine in Nevada had large negative net carbonate values (NCV – indicative of acid drainage potential), but the EIS stated that 20-week kinetic results had near-neutral pH values (6-7), and that the high percentage of carbonate rocks in the pit area after mining would result in neutral drainage.

High Acid Drainage Potential

Only five mines were identified as having high acid drainage potential. It is notable that none of the original EISs (Golden Sunlight and Zortman and Landusky, MT) or EAs (Black Pine, MT; Battle Mountain Phoenix, NV) for these mines indicated high acid drainage potential, and it was only recognized in all cases by EISs or EAs that were written following actual evidence of acid drainage occurring.

5.6.2. CONTAMINANT LEACHING POTENTIAL

Information on contaminant leaching potential was typically based on constituents identified in short-term leach test results, although some limited information was also available from longer-term kinetics testing results. If quantitative information on contaminant leaching potential was available (i.e., concentrations in short-term or kinetic test leachate), these results were compared to water quality standards (drinking water or other standards or criteria, as identified in the EISs). In other cases, the contaminant leaching potential was identified qualitatively. The contaminants identified were most often metals/metalloids, although other contaminants such as cyanide, sulfate, and/or nitrates were also listed.

The information on contaminant leaching potential was summarized and scored according to the following four categories:

- No information available (0)
- Low contaminant leaching potential (leachate does not exceed water quality standards) (1)
- Moderate potential for elevated contaminant concentrations (leachate exceeds water quality standards by 1-10 times) (2)
- High potential for elevated contaminant concentrations (leachate exceeds water quality standards by over 10 times) (3)

The categories and factors chosen to score and describe contaminant leaching potential are not absolute in terms of potential environmental impact because different mines used different types of leaching procedures with different solid:liquid ratios (see Maest, et al., 2005) and different approaches to qualitatively describing the contaminant leaching potential. In addition, the potential for contaminant leaching is predicted without considering mitigation measures. The Environmental Protection Agency Potential uses TCLP leachate standards for hazardous waste that are based on 100 times the drinking water standards. However, we are using the four categories listed above as a conservative approach (environmentally protective) to gain a rough understanding of the potential for contaminant leaching from mining waste.

In the scoring, contaminant leaching potential was categorized according to the unit or material with the greatest potential to produce contaminants. For the entries with qualitative descriptions of the potential for contaminant leaching, if the EIS statement was somewhat negative (e.g., the potential for contaminant leaching exists), the entry was scored as a 2. If metals concentrations expected from mining operations were described as "low" or as not having significant increases over background/baseline concentrations, the entry was scored as a 1. For mines with multiple EISs, the EIS with the highest potential to generate contaminants was used as the score for the mine.

Table 5.11 shows the distribution and identity of mines in the four categories.

No Information Available

The EISs for 15 mines (21%) contained no information on contaminant leaching potential. These mines included two in Alaska, five (of eight) in Arizona, two fin California, one each in Idaho, Montana and New Mexico, and three in Nevada. Three of these mines (True North, AK; Royal Mountain King, CA (EIR-EA); Rain, NV) had EAs rather than EISs.

Low Contaminant Leaching Potential

An approximately equal number of mines had low (22 or 31%) and moderate (21 or 30%) contaminant leaching potential. Two of the mines in the low contaminant leaching potential category (East Boulder, Montana and Tyrone, New Mexico) did not perform short-term leach or kinetic tests (the East Boulder Mine also performed no static testing). In both cases, the low contaminant leaching potential was based on the low sulfur/sulfide content.

In fact, many of the mines in this category based the low contaminant leaching potential on predicted low acid generation potential. For those mines that did conduct contaminant leaching tests (e.g., short-term leach tests), results were variably compared to drinking water standards and standards for leach tests (e.g., soluble threshold levels for California; TCLP levels). In addition to the East Boulder, Montana, and Tyrone, New Mexico mines, five other mines in this category did not perform short-term leach tests (Fort Knox, AK : Mesquite, CA; Stibnite, ID; Basin Creek and Diamond Hill, MT). These five mines did perform kinetic tests, but metals were not always determined to have been analyzed in the leachate.

Table 5.11. Contaminant Leaching Potential

0		1		2		3	
No information available		Low		Moderate		High	
AJ Project	AK	Fort Knox	AK	Pogo Project	AK	Kensington Project	AK
True North	AK	Greens Creek*	AK	Carlotta	AZ	Red Dog	AK
Bagdad*	AZ	Safford (Dos Pobres)	AZ	McLaughlin*	CA	Beartrack	ID
Cyprus Tohono	AZ	Sanchez	AZ	Black Pine*	MT	Golden Sunlight*	MT
Morenci	AZ	American Girl*	CA	Mineral Hill*	MT	Rock Creek	MT
Ray*	AZ	Castle Mountain*	CA	Montanore	MT	Bald Mountain	NV
Yarnell	AZ	Hayden Hill	CA	Stillwater*	MT	Battle Mountain Phoenix	NV
Imperial	CA	Jamestown*	CA	Troy	MT	Cortez Pipeline	NV
Royal Mountain King*	CA	Mesquite*	CA	Zortman and Landusky*	MT	Gold Quarry	NV
Stone Cabin	ID	Black Pine	ID	Florida Canyon*	NV	Leeville	NV
Montana Tunnels	MT	Grouse Creek*	ID	Goldstrike	NV	Lone Tree*	NV
Copper Flat	NM	Stibnite	ID	Griffon	NV	Round Mountain*	NV
Cortez	NV	Thompson Creek*	ID	Jerritt Canyon*	NV	Twin Creeks*	NV
Dash	NV	Basin Creek	MT	Marigold	NV		
Rain	NV	Beal Mountain*	MT	Mule Canyon	NV		
		Diamond Hill	MT	Olinghouse	NV		
		East Boulder	MT	Pete	NV		
		Tyrone Little Rock	NM	Rochester*	NV		
		Austin Gold Venture	NV	Ruby Hill*	NV		
		Robinson (Ruth)	NV	Gilt Edge	SD		
		Trenton Canyon	NV	Flambeau*	WI		
		Lisbon Valley	UT				
	15		22		21		13

Low = leachate concentrations < water quality standards; Moderate = leachate exceeds water quality standards by 1 - 10 times; High = leachate exceeds water quality standards by > 10 times.

Moderate Contaminant Leaching Potential

Twenty-one mines (30%) identified had moderate contaminant leaching potential. Four of the mines in this category did not perform short-term leach or kinetic testing (Black Pine, Montanore, Troy, MT; Pete, NV). Two of the Montana mines based the moderate contaminant leaching potential on tailings water quality. The Goldstrike Mine in Nevada also did not perform short-term leach tests but did conduct kinetic testing.

High Contaminant Leaching Potential

Thirteen (18%) of the mines identified had high contaminant leaching potential (Kensington Project, AK; Beartrack, ID; Golden Sunlight and Rock Creek mines, MT; Bald Mountain, Battle Mountain Complex, Cortez Pipeline, Gold Quarry/Maggie Creek, Leeville, Lone Tree, Round Mountain and Twin Creeks, NV). Two of the mines in this category conducted no short-term leach tests (Rock Creek, MT; Gold Quarry/Maggie Creek, NV), but they did conduct kinetic testing.

Nevada had the highest percentage (75%) of mines with either moderate or high contaminant leaching potential (18/24 mines), followed by Montana with 62% (8/13 mines). Nevada also had a high percentage (75%) of mines conducting short-term leach tests (18/24 mines). California had the highest percentage (63%) of mines with low contaminant leaching potential (5/8 mines) and only one (McLaughlin) with moderate contaminant leaching potential. California also had a high percentage (75%) of mines conducting short-term leach tests (6/8 mines). Both states have

short-term leach tests that were developed specifically for use in those states – the meteoric water mobility procedure (MWMP) for Nevada and the waste extraction test (CAL WET) test for California.

Of the 12 mines with high contaminant leaching potential, only three (Red Dog, AK; Golden Sunlight, MT; Battle Mountain Complex, NV) also identified high acid generation potential. Five mines (Kensington Project, AK; Beartrack, ID; Rock Creek, MT; Bald Mountain and Cortez Pipeline, NV) identified high contaminant leaching potential and low acid drainage potential.

5.6.3. POTENTIAL GROUNDWATER QUALITY IMPACTS

Groundwater impact potential refers to the proposed project's potential to adversely affect groundwater quality in the absence of mitigation measures. Section 5.7.1 describes the projects' predicted impact on groundwater after proposed mitigation measures were put in place. The information on groundwater quality impact potential was summarized and scored according to the following four categories:

- No information available (0)
- Low groundwater quality impacts (< relevant standards) (1)
- Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) (2)
- High groundwater quality impacts (>10 times relevant standards) (3)

For mines with multiple EISs, the EIS with the highest individual score for potential groundwater impacts was used as the score for the mine. Scores for potential groundwater impacts were often based on qualitative information or descriptions (e.g., "moderate" effects expected on groundwater quality). If an EIS entry noted anything regarding potential groundwater quality that was negative, it was scored as a 2 (moderate impacts). The EISs were also reviewed for any information on the potential for long-term groundwater quality impacts.

Table 5.12 lists the mines in the four categories for groundwater impact potential.

No Information Available

Fourteen (20%) of the 71 reviewed mines with EISs did not provide any information on groundwater quality impact potential. Four of these mines had EAs rather than EISs (Fort Knox and True North, AK; Basin Creek, MT; Pete, NV). Of the remaining 10 mines in this category, four were in Arizona, two in New Mexico, and one each was in Alaska, Idaho, Montana, and Nevada.

Low Groundwater Quality Impact Potential

At 19 mines (27%), the EISs identified low groundwater impact potential. Of these mines, one had high acid drainage potential, and four had high contaminant leaching potential. Nine of these 19 mines had shallow depths to groundwater or springs on site.

Moderate Groundwater Quality Impact Potential

The majority of the mines (33 or 47%) had moderate groundwater impact potential. Two of these mines had high acid drainage potential (Zortman and Landusky, MT; Battle Mountain Complex, NV), and five had high contaminant leaching potential (Rock Creek, MT; Battle Mountain Complex, Cortez Pipeline, Leeville, Twin Creeks, NV). Twenty-one of these 33 mines had close proximity to groundwater or springs on site.

Table 5.12. Groundwater Quality Impact Potential

0		1		2		3	
No information available		Low		Moderate		High	
AJ Project	AK	Kensington Project	AK	Greens Creek*	AK	Pogo Project	AK
Fort Knox	AK	Red Dog	AK	Carlotta	AZ	McLaughlin*	CA
True North	AK	Bagdad*	AZ	American Girl*	CA	Golden Sunlight*	MT
Morenci	AZ	Cyprus Tohono	AZ	Hayden Hill	CA	Florida Canyon*	NV
Ray*	AZ	Sanchez	AZ	Jamestown*	CA	Round Mountain*	NV
Safford (Dos Pobres)	AZ	Castle Mountain*	CA	Mesquite*	CA		
Yarnell	AZ	Imperial	CA	Royal Mountain King*	CA		
Beartrack	ID	Black Pine	ID	Grouse Creek*	ID		
Basin Creek	MT	Stone Cabin	ID	Stibnite	ID		
Black Pine*	MT	Diamond Hill	MT	Thompson Creek*	ID		
Copper Flat	NM	Stillwater*	MT	Beal Mountain*	MT		
Tyrone Little Rock	NM	Bald Mountain	NV	East Boulder	MT		
Griffon	NV	Cortez	NV	Mineral Hill*	MT		
Pete	NV	Gold Quarry	NV	Montana Tunnels	MT		
		Lone Tree*	NV	Montanore	MT		
		Mule Canyon	NV	Rock Creek	MT		
		Rain	NV	Troy	MT		
		Ruby Hill*	NV	Zortman and Landusky*	MT		
		Lisbon Valley	UT	Austin Gold Venture	NV		
				Battle Mountain Phoenix	NV		
				Cortez Pipeline	NV		
				Dash	NV		
				Goldstrike	NV		
				Jerritt Canyon*	NV		
				Leeville	NV		
				Marigold	NV		
				Olinghouse	NV		
				Robinson (Ruth)	NV		
				Rochester*	NV		
				Trenton Canyon	NV		
				Twin Creeks*	NV		
				Gilt Edge	SD		
				Flambeau*	WI		
	14		19		33		5

For potential impacts (without considering effect of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

High Groundwater Quality Impact Potential

Only five of the reviewed mines (7%) were identified as having a high potential for groundwater impact (Pogo Project, AK; McLaughlin, CA; Golden Sunlight, MT; Florida Canyon and Round Mountain, NV). Of these, only the Golden Sunlight Mine had high acid drainage and contaminant leaching potential. The Round Mountain Mine had high contaminant leaching potential but low acid drainage potential. The other mines in this category had low to moderate acid drainage and contaminant leaching potential.

Long-term Groundwater Quality Impacts

A number of mines mentioned that groundwater quality impacts would not occur until years in the future or that groundwater impacts would worsen with time. These delayed impacts often result from rising water levels in underground mines, cessation of groundwater pumping in open pit mines or movement of the wetting front through waste rock dumps or other unsaturated mine materials over time. At the Montana Tunnels mine, poor water quality was not expected to seep out of the pit and affect downgradient groundwater and surface water resources until 480 years after mining.

A number of other mine EISs mention long-term groundwater quality impacts. The 2003 EIS for the Pogo Project in Alaska stated that there is some potential for increased concentrations of contaminants downgradient of the mine over the long term (thousands of years) in excess of 10 times water quality standards.

The 2004 Draft EIS for the Golden Sunlight Mine in Montana noted that after mining, if the groundwater table rebounds to a static condition, fracture-controlled flow to surface seeps could increase and acid springs could develop again. They suggest that maintaining the pit as a hydrologic sink could minimize the risk of seep development. At the Montana Tunnels mine, poor water quality is not expected to seep out of the pit and affect downgradient groundwater and surface water resources until 480 years after mining. The EIS for the Montanore Mine in Montana noted that after water levels rise in the mine, discharge could occur from the adits or "along natural pathways."

Although the water is expected to be of relatively good quality, the EIS stated that the potential for acid drainage exists. The new project EIS for the Rock Creek Project in Montana noted that seepage from the proposed tailings impoundment to groundwater could approach several hundred gallons per minute by the end of the 30-year mine life, and that the long-term potential for acid drainage was unknown at this point. The EIS proposed a tailings seepage pumpback system to prevent changes in groundwater quality.

Modeling performed for the Battle Mountain Phoenix project in Nevada predicted that waste rock infiltration could degrade downgradient groundwater, and the potential for long-term impacts to groundwater quality existed during the post-closure period. They proposed a contingent long-term groundwater management plan to address these potential impacts. The 1991 EIS for the Goldstrike Project in Nevada stated that groundwater could be impacted by outflow from the pit once the pit reaches steady state conditions. The subsequent 2003 EIS stated that a pit lake was not expected to discharge to groundwater, but that water quality impacts were possible in areas affected by mine water management activities, including reinfiltration of dewatering water. Groundwater at the Rochester Mine in Nevada, which had two EAs, was predicted to be of good quality. The 2003 expansion EA for the Rochester Mine in Nevada stated that the Coeur operations or Relief Canyon operations near the Rochester Mine could generate long-term impacts to groundwater.

5.6.4. POTENTIAL SURFACE WATER QUALITY IMPACTS

Surface water impact potential refers to the proposed project's potential to adversely affect surface water quality in the absence of mitigation measures. Section 5.7.2 describes the project's predicted impact on surface water resources after proposed mitigation measures were put in place. The information on surface water quality impact potential was summarized and scored according to the following four categories:

- No information available (0)
- Low surface water quality impacts (< relevant standards) (1)
- Moderate surface water quality impacts (≥ and up to 10 times relevant standards) (2)
- High surface water quality impacts (>10 times relevant standards) (3)

For mines with multiple EISs, the EIS with the highest individual score for potential surface water impacts was used as the score for the mine. Scores for potential surface water impacts were often based on qualitative information or descriptions (e.g., no impacts expected on surface water quality). If an EIS entry noted anything regarding potential surface water quality that was negative, including a potential for sedimentation or erosion effects to surface water, it

was scored as a 2 (moderate impacts). The EISs were also reviewed for any information on the potential for long-term surface water quality impacts and the effect of water quantity (e.g., groundwater pumping) on surface water resources.

Table 5.13 lists the mines that fall into the four categories for surface water impact potential.

Table 5.13. Surface Water Quality Impact Potential

0		1		2		3	
No information available		Low		Moderate		High	
AJ Project	AK	Kensington Project	AK	Greens Creek*	AK	Zortman and Landusky*	MT
Fort Knox	AK	Pogo Project	AK	Carlotta	AZ	Twin Creeks*	NV
Red Dog	AK	Bagdad*	AZ	Hayden Hill	CA		
True North	AK	Cyprus Tohono	AZ	Jamestown*	CA		
Morenci	AZ	Sanchez	AZ	McLaughlin*	CA		
Ray*	AZ	American Girl*	CA	Mesquite*	CA		
Safford (Dos Pobres)	AZ	Castle Mountain*	CA	Grouse Creek*	ID		
Yarnell	AZ	Imperial	CA	Stibnite	ID		
Royal Mountain King*	CA	Black Pine	ID	Thompson Creek*	ID		
Beartrack	ID	Stone Cabin	ID	Beal Mountain*	MT		
Basin Creek	MT	Diamond Hill	MT	Montana Tunnels	MT		
Black Pine*	MT	East Boulder	MT	Rock Creek	MT		
Montanore	MT	Golden Sunlight*	MT	Battle Mountain Phoenix	NV		
Copper Flat	NM	Mineral Hill*	MT	Dash	NV		
Tyrone Little Rock	NM	Stillwater*	MT	Goldstrike	NV		
Florida Canyon*	NV	Troy	MT	Griffon	NV		
Rain	NV	Austin Gold Venture	NV	Jerritt Canyon*	NV		
		Bald Mountain	NV	Leeville	NV		
		Cortez	NV	Lone Tree*	NV		
		Cortez Pipeline	NV	Marigold	NV		
		Gold Quarry	NV	Olinghouse	NV		
		Mule Canyon	NV	Pete	NV		
		Ruby Hill*	NV	Robinson (Ruth)	NV		
		Lisbon Valley	UT	Rochester*	NV		
				Round Mountain*	NV		
				Trenton Canyon	NV		
				Gilt Edge	SD		
				Flambeau*	WI		
	17		24		28		2

For potential impacts (without considering effect of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

No Information Available

Approximately one-quarter (17 or 24%) of the mines did not provide any information on the potential for surface water quality impacts. Mines in this category included two in Alaska, four in Arizona, one each in California and Idaho, three in Montana, two in New Mexico, and two in Nevada. Of these 18 mines, five had EAs rather than EISs (Fort Knox and True North, AK; Royal Mountain King, CA (EIR-EA); Basin Creek, MT; Rain, NV).

Low Surface Water Quality Impact Potential

Nearly equal numbers of mines were identified as having low (24 or 34%) and moderate (28 or 40%) potential for surface water quality impacts. Of the 24 mines with low potential for surface water quality impacts, one had high acid drainage and contaminant leaching potential (Golden Sunlight, Montana), and four others had high contaminant leaching potential (Kensington, AK; Bald Mountain, Cortez Pipeline, Gold Quarry/Maggie Creek, NV). For the two Golden Sunlight EISs with information on surface water quality impact potential, the low potential was attributed to: the lack of any perennial surface waters in close proximity of the proposed facilities (if clean-up efforts are prompt); the slow movement of the wetting front through the waste rock dumps; and run-on controls.

Six of the 24 mines with low surface water quality impact potential had perennial streams on site (Kensington and Pogo, AK; Stone Cabin, ID; East Boulder, Mineral Hill, and Troy, MT), and 11 were far from surface water resources (> one mile). Those mines with close proximity to surface water but low potential for impacts generally ascribed the low potential to dilution. In most cases, surface water quality was expected to have some impact from mining operations but was not predicted or expected to exceed relevant water quality standards in surface water. The Kensington Project in Alaska was expected to have low surface water quality impacts, even though it is close to surface water and has high contaminant leaching potential. The low potential at the Kensington Project was attributed to the low acid drainage potential and the observation that waste rock and tailings infiltration water quality is expected to be similar to background groundwater quality.

Moderate Surface Water Quality Impact Potential

Twenty-eight mines (40%) were identified as having moderate potential for surface water quality impacts. Of these 28 mines, one mine (Battle Mountain Phoenix, NV) had high potential for acid drainage and contaminant leaching. However, the closest perennial surface water is one mile from the facilities, and no offsite impacts to surface water were expected. Four other mines in this category had high contaminant leaching potential (Rock Creek, MT; Leeville, Lone Tree, Round Mountain, NV). The Rock Creek Project is also located close to surface water resources. The Rock Creek Project EIS acknowledged the potential impact to surface water quality of the mine facilities, but noted that water treatment, dilution, and groundwater pumping would help mitigate these impacts. The Lone Tree Mine is located two miles from the Humboldt River but discharges dewatering water to the Humboldt River. Water pumped from the ground and discharged into the Humboldt River was considered to generally be of good quality; however, the 1996 EIS did note recent increased concentrations of arsenic, iron, and sulfate in mine discharge water and aquatic life exceedences of iron, copper and lead in the discharge water. The Leeville Mine proposed to discharge dewatering water to reinfiltration basins and also to the Humboldt River if that does not provide sufficient volume, and discharge water did not meet the arsenic drinking water standard. Round Mountain has no perennial streams on site.

High Surface Water Quality Impact Potential

Only two of the reviewed mines were identified as having a high potential for surface water impacts (Zortman and Landusky, MT; Twin Creeks, NV). The 1993 Supplemental EA for the Zortman and Landusky Mine noted that existing water quality in Mill Gulch and upper Sullivan Creek has already become acidic as a result of waste rock and leach pad leachate. Similarly, surface water at the Twin Creeks Mine had already shown occasional exceedences of total dissolved solids and arsenic (arsenic by over 10 times the 10-µg/l drinking water standard) as a result of discharge of dewatering water in Rabbit Creek.

Long-term Surface Water Quality Impact Potential

A number of EIS mentioned the effect of time on potential impacts to surface water resources as a result of mining operations. The 1997 EIS for the Golden Sunlight Mine in Montana noted that slow movement of the wetting front through waste rock and run-on controls could limit potential migration of acid drainage to surface water. This same mechanism could delay impacts of acid drainage to surface water. The Montana Tunnels Mine EIS, as noted earlier, stated that poor-quality water was not expected to seep out of the pit until hydrologic equilibrium was reached in

480 years. At this time, no more than 15 gpm was expected to flow out of the pit toward Spring Creek. Contaminants in the pit seepage water were expected to be diluted and retarded in groundwater, and the impact on Spring Creek water quality was stated as unknown. The 1995 EIS for the Rock Creek Mine in Montana noted that the long-term potential for acid drainage was unknown, and the 2001 EIS noted that if there is outflow of mine adit water, perpetual treatment might be required prior to discharge to the Clark Fork River.

The 1984 Grouse Creek, Idaho, EIS mentioned that water quality changes in surface streams were predicted to be of short duration. Modeling conducted (PYROX modeling of tailings) for the 1999 Thompson Creek, Idaho, EIS concluded that potential impacts to water quality in Squaw Creek should be reduced as a result of excess neutralization capacity at the end of the 100-year period.

Water Quantity Effects

Several EISs mentioned potential water quantity effects on surface water resources. Most of these potential impacts were related to groundwater pumping for dewatering operations and excavation of underground workings. The 2001 EIS for the Rock Creek Project in Montana concluded that water levels in and groundwater inflow to several wilderness lakes overlying the mined-out portions of the underground mine could potentially be reduced if faults or fractures acted as groundwater conduits and grouting programs were ineffective. The 1995 Bald Mountain, Nevada, EIS acknowledged the potential for reduced flow in the Cherry Creek Spring as a result of dewatering operations. Similarly, the Battle Mountain, Nevada, EIS noted that dewatering operations could reduce flow in perennial streams and springs. The 2003 Goldstrike, Nevada, EIS concluded that the primary issue related to the quality of surface water was degraded stream water quality resulting from dewatering operations. Based on hydrologic modeling results, there was some recognized potential for additional flow reductions to perennial water sources in localized areas from future mine-induced drawdown. Finally, the Marigold, Nevada, 2001 EIS stated that groundwater pumping or drainage modification could cause reduction in surface water flows and impacts to riparian or wetland areas.

5.6.5. POTENTIAL PIT WATER IMPACTS

Pit water impact potential refers to the proposed project's potential to adversely affect water quality in the pit in the absence of mitigation measures. Water in the pit refers to either pit lake water or water associated in the interstices of pit backfill material. Section 5.7.3 describes the projects' predicted impact on pit water quality after proposed mitigation measures were put in place. The information on pit water quality impact potential was summarized and scored according to the following five categories:

- No information available (0)
- Low pit water quality impacts (water quality similar to surrounding groundwater or < relevant standards) (1)
- Moderate pit water quality impacts (≥ and up to 10 times relevant standards) (2)
- High pit water quality impacts (>10 times water quality standards) (3)
- No pit lake or long-term standing water expected (pit above water table or no pit) (4)

For mines with multiple EISs, the EIS with the highest individual score for potential pit water impacts was used as the score for the mine. Scores for potential pit water impacts were often based on qualitative information or descriptions (e.g., pit water quality expected to be poor). If an EIS entry noted anything regarding potential pit water quality that was negative, it was scored as a 2 (moderate impacts). If the pit was proposed to be backfilled but the EIS did not address backfill water quality, it was scored as a 0. For mines with multiple proposed pits above the water table, the pit with the highest score (1, 2, or 3) was used to score the mine as a whole. Information on long-term pit water quality impacts is also discussed.

Table 5.14 lists the mines that fall into the five categories for potential pit water quality impacts.

Table 5.14. Pit Water Quality Impact Potential

0		1		2		3		4	
No information available		Low		Moderate		High		No pit lake expected to form (pit above water table or no pit)	
Fort Knox	AK	Bagdad*	AZ	Sanchez	AZ	Safford (Dos Pobres)	AZ	AJ Project	AK
Red Dog	AK	Castle Mountain*	CA	Jamestown*	CA	McLaughlin*	CA	Greens Creek*	AK
True North	AK	Imperial	CA	Mesquite*	CA	Golden Sunlight*	MT	Kensington Project	AK
Carlotta	AZ	Black Pine	ID	Beartrack	ID	Montana Tunnels	MT	Pogo Project	AK
Morenci	AZ	Stone Cabin	ID	Grouse Creek*	ID	Gold Quarry	NV	Cyprus Tohono	AZ
Ray*	AZ	Basin Creek	MT	Thompson Creek*	ID	Goldstrike	NV	Hayden Hill	CA
Yarnell	AZ	Tyrone Little Rock	NM	Cortez Pipeline	NV	Lone Tree*	NV	Diamond Hill	MT
American Girl*	CA			Marigold	NV	Twin Creeks*	NV	East Boulder	MT
Royal Mountain King*	CA			Mule Canyon	NV	Lisbon Valley	UT	Mineral Hill*	MT
Stibnite	ID			Olinghouse	NV	Flambeau*	WI	Montanore	MT
Beal Mountain*	MT			Robinson (Ruth)	NV			Rock Creek	MT
Black Pine*	MT			Round Mountain*	NV			Stillwater*	MT
Zortman and Landusky*	MT			Gilt Edge	SD			Troy	MT
Copper Flat	NM							Bald Mountain	NV
Austin Gold Venture	NV							Cortez	NV
Battle Mountain Phoenix	NV							Griffon	NV
Dash	NV							Jerritt Canyon*	NV
Florida Canyon*	NV							Leeville	NV
Pete	NV							Rain	NV
								Rochester*	NV
								Ruby Hill*	NV
								Trenton Canyon	NV
	19		7		13		10		22

For potential impacts (without considering effect of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

No Information Available

A high proportion of the mines with proposed open pits that were expected to contain water (19 or 27%) did not provide information on potential pit water quality impacts. Of these, four had EAs rather than EISs (Fort Knox and True North, AK; Royal Mountain King, CA (EIR-EA); Austin Gold Venture, NV), and two were land-exchange EISs (Morenci and Ray, AZ). Of the remaining 13 mines, two were in Arizona, one each was in Alaska, California, Idaho and New Mexico, three were in Montana and four were in Nevada.

Low Pit Water Quality Impact Potential

Seven (10%) of the mines identified low potential for pit water quality impacts. The majority of these mines ascribed the low impact potential for impact to low acid drainage and/or contaminant leaching potential of rocks within the pit. None of these mines identified a high potential for either acid drainage or contaminant leaching.

Moderate Pit Water Quality Impact Potential

Moderate pit water quality impacts were identified for 13 (18%) of the 71 NEPA mines. Of these, the EIS for the Beartrack, Idaho mine had high contaminant leaching potential. The EIS for the Round Mountain Mine and the Cortez Pipeline mines in Nevada identified moderate acid drainage potential. The potential for moderate pit water quality impacts was generally ascribed to increased concentrations from evapoconcentration and the presence of materials with elevated acid-generating and/or contaminant leaching potential within the pit. In some cases, future water quality in the pits was based on observed water quality in existing pits at the site.

High Pit Water Quality Impact Potential

Ten (14%) of the mines were identified as having a high potential for pit water quality impacts, including the McLaughlin Mine in California, the Golden Sunlight and Montana Tunnels mines in Montana, and the Flambeau Mine (with a backfilled pit) in Wisconsin. The Golden Sunlight Mine identified high acid drainage and contaminant leaching potential, and the Gold Quarry/Maggie Creek, Lone Tree, Cortez Pipeline and Twin Creeks mines in Nevada identified high contaminant leaching potential. The majority (seven) of these 10 mines conducted both water quantity and quality modeling to predict pit water quality. The Flambeau Mine conducted only water quality modeling of the pit backfill leachate and predicted that manganese concentrations would be over 10 times drinking water standards.

No Pit Lake or Water Expected

Twenty-two (31%) of the mines were not expecting water in the pit either because the pit was above the water table or it was a proposed underground mine. Even when the bottom of a pit may be above the water table, seasonal water can still collect in the pit. In a number of these instances, remedial measures were proposed to avoid accumulation of pit water (see Section 5.6.3). Of the 22 mines, all the mines in Alaska and Montana and the Leeville Mine in Nevada are underground mines; all the other listed mines in this category are open pit mines with pit bottoms expected to be above the water table.

Long-term Pit Water Quality Impacts

EISs for several mines discussed the potential impact of time on pit water quality. The pit water at the Montana Tunnels Mine in Montana (as noted earlier in the section on potential groundwater quality impacts) was expected to become acidic and discharge to groundwater after 480 years. Pit water in the Cortez Pipeline Mine in Nevada was expected to exceed Nevada drinking water standards for pH (elevated pH), fluoride, sulfate, cadmium, manganese, mercury silver, and total dissolved solids at 250 years post closure. The Lone Tree, Nevada, open pit water quality was expected to be acidic initially, become neutral after 10 years and exceed drinking water standards for arsenic (until 10 years post-closure, then not exceed), cadmium (for one year only), nickel, fluoride, antimony (after 25 years) and sulfate (until 10 years). Nickel and fluoride concentrations were expected to exceed water quality standards by less than 10 times, but antimony concentrations are expected to be over 10 times higher than standards. The EIS for the Robinson (Ruth) Mine in Nevada stated that some improvement in pit (Liberty and Ruth pits) water quality could be expected as mineralization is removed by mining. The EIS also noted that pit dewatering and subsequent refilling would result in improved pit water quality because acidic solutions were discharged into the pit during historic leaching activities.

5.7. PROPOSED MITIGATION

EISs may analyze and subsequent Records of Decision (ROD) may require mitigation to address potential water quality impacts that are identified in the EISs. Mitigation are commonly designed for the protection of groundwater and surface water resources and may address pit water quality (depending on state requirements).

Mitigation include pollution prevention measures and abatement measures. Pollution prevention measures aim to control pollution at its source and include liners, special handling of potentially acid-generating (PAG) waste, adit plugging, leak-detection systems, and caps and covers. Abatement measures are designed to mitigate pollution after it has been created and include capture, treatment and discharge of contaminated water, or in some cases may require replacement measures (such as for water quantity). They may also be short-term (e.g., during the operational life of the project) or long-term (e.g., perpetual water treatment and/or site maintenance).

In many cases, the EISs reviewed described mitigation that would be included in the mine plan "if necessary." Many EISs described measures to prevent or mitigate the impacts of acid drainage, including: isolation, segregation, or amendment of acid-generating wastes; and capture and treatment of acid drainage. The mitigation identified in EISs were for proposed projects or expansions of existing projects and are therefore proposed rather than actual mitigation. The mitigation that are actually implemented will depend on a number of factors and are often contained as requirements in the ROD after the mine is permitted. However, the proposed mitigation discussed in this section are an important part of the NEPA process because they respond to the identified potential impacts. In many cases they determine, or are depended upon to bring about, the predicted or post-mitigation, impacts (e.g., liners used for potential cyanide contamination leading to prediction of no or acceptable contamination).

Water-quality mitigation identified in the EISs fell into groundwater, surface water, and pit water measures. For mines that proposed treatment as part of the mitigation measures, the type of treatment was also categorized and scored.

5.7.1. PROPOSED GROUNDWATER MITIGATION

The information on groundwater mitigation contained in the EISs was summarized and scored according to one or more of the following categories:

- No information available or no mitigation identified (0)
- Groundwater monitoring or characterization of mined materials (1)
- Source controls without treatment (liners, leak detection systems, run on/off controls, caps/covers, adit plugging) (2)
- Groundwater/leachate capture with treatment (3)
- Perpetual groundwater capture and/or treatment; long-term mitigation fund (4)
- Liming, blending, segregation, etc. of potentially acid-generating (PAG) material (5)

Table 5.15 lists the mines with proposed groundwater mitigation that fell into the six categories.

No Information Available or No Mitigation Identified

Twelve (17%) of the 71 NEPA mines did not identify any type of groundwater mitigation.

Groundwater Monitoring or Characterization of Mined Materials

Nearly half of the mines (33, or 46%) proposed groundwater monitoring or materials characterization as a type of groundwater mitigation. Monitoring and characterization do not directly mitigate impacts to groundwater, but results of these tests can be used to identify the need for mitigation after the facility is in operation.

Table 5.15. Proposed Groundwater Mitigation

0		1		2		3		4		5	
No information available		Monitoring or characterization		Source controls without treatment		Groundwater/leachate capture		In-perpetuity capture and/or treatment; long-term fund		Liming, blending, segregation, etc. of PAG material	
AJ Project	AK	Carlotta	AZ	Kensington Project	AK	Greens Creek*	AK	Golden Sunlight*	MT	Greens Creek*	AK
Fort Knox	AK	Morenci	AZ	Pogo Project	AK	Kensington Project	AK	Rock Creek	MT	Pogo Project	AK
True North	AK	Safford	AZ	Red Dog	AK	Pogo Project	AK	Goldstrike	NV	Grouse Creek*	ID
Bagdad*	AZ	Hayden Hill	CA	Carlotta	AZ	Red Dog	AK			Stone Cabin	ID
Ray*	AZ	Jamestown*	CA	Cyprus Tohono	AZ	Castle Mountain*	CA			Beal Mountain*	MT
Royal Mountain King*	CA	McLaughlin*	CA	Morenci	AZ	Hayden Hill	CA			Diamond Hill	MT
Stone Cabin	ID	Mesquite*	CA	Safford	AZ	Jamestown*	CA			Montanore	MT
Basin Creek	MT	Beartrack	ID	Sanchez	AZ	Mesquite*	CA			Zortman Landusky*	MT
Troy	MT	Black Pine	ID	Yarnell	AZ	Thompson Creek*	ID			Florida Canyon*	NV
Rochester*	NV	Grouse Creek*	ID	American Girl*	CA	Golden Sunlight*	MT			Jerritt Canyon*	NV
Trenton Canyon	NV	Stibnite	ID	Castle Mountain*	CA	Mineral Hill*	MT			Leeville	NV
Copper Flat	NM	Thompson Creek*	ID	Hayden Hill	CA	Montana Tunnels	MT			Marigold	NV
		Beal Mountain*	MT	Imperial	CA	Rock Creek	MT			Twin Creeks*	NV
		Golden Sunlight*	MT	Jamestown*	CA	Stillwater*	MT				
		Montanore	MT	Mesquite*	CA	Zortman Landusky*	MT				
		Rock Creek	MT	Beartrack	ID	Austin Gold Venture	NV				
		Stillwater*	MT	Black Pine	ID	Phoenix	NV				
		Zortman Landusky*	MT	Grouse Creek*	ID	Cortez	NV				
		Austin Gold Venture	NV	Stibnite	ID	Cortez Pipeline	NV				
		Bald Mountain	NV	Thompson Creek*	ID	Gold Quarry	NV				
		Phoenix	NV	Beal Mountain*	MT	Goldstrike	NV				
		Cortez	NV	Black Pine*	MT	Leeville	NV				
		Cortez Pipeline	NV	East Boulder	MT	Lone Tree*	NV				
		Dash	NV	Golden Sunlight*	MT	Pete	NV				
		Gold Quarry	NV	Montana Tunnels	MT	Rain	NV				
		Goldstrike	NV	Montanore	MT	Robinson (Ruth)	NV				
		Lone Tree*	NV	Stillwater*	MT	Flambeau*	WI				
		Marigold	NV	Zortman Landusky*	MT						
		Mule Canyon	NV	Venture	NV						
		Pete	NV	Bald Mountain	NV						
		Rain	NV	Battle Mountain Phoenix	NV						
		Robinson (Ruth)	NV	Cortez	NV						
		Twin Creeks	NV	Cortez Pipeline	NV						
		Lisbon Valley Copper	UT	Florida Canyon*	NV						
				Gold Quarry	NV						
				Griffon	NV						
				Jerritt Canyon*	NV						
				Leeville	NV						
				Marigold	NV						
				Olinghouse	NV						
				Pete	NV						
				Rain	NV						
				Robinson (Ruth)	NV						
				Round Mountain*	NV						
				Ruby Hill*	NV						
				Twin Creeks*	NV						
				Tyrone - Little Rock	NM						
				Gilt Edge	SD						
				Copper	UT						
				Flambeau*	WI						
	12		33		50		27		3		13

Source Controls Without Treatment (liners, leak detection systems, run on/off controls, caps/covers, adit plugging)

The majority of the mines (50, or 70%) proposed source controls without treatment to protect groundwater. The majority of these measures consisted of liners for tailings impoundments and heap leach operations to prevent groundwater contamination ("zero discharge" facilities).

Groundwater/Leachate Capture with Treatment

Approximately one-third (27 or 38%) of the mines proposed groundwater or leachate capture, either with or without treatment.

Perpetual Groundwater Capture and/or Treatment; Long-term Mitigation Fund

Only three of the mines (4%) (Rock Creek and Golden Sunlight, MT; Goldstrike (Betze), NV) mentioned in perpetuity capture and/or treatment or other type of long-term groundwater mitigation. For Rock Creek and Goldstrike, perpetual treatment or maintenance was identified as a possible long-term option if necessary, and the Goldstrike Mine proposed a $250,000 fund to cover monitoring costs beyond the year 2030 (in a 1991 EIS), and a $1,000,000 fund for the review, monitoring, and mitigation of impacts directly associated with the project, but not specifically identified in the EIS. Seepage from tailings and waste rock at the Golden Sunlight Mine in Montana, however, was expected in the 1997 EIS to require perpetual treatment.

The three mines, where EISs identified groundwater capture and treatment mitigation requirements, collected and treated acid drainage from beneath waste dumps, dewatered tailings or tailings leachate.

Liming, Blending, Segregation, etc. of Potentially Acid-Generating (PAG) Material

Thirteen (18%) of the mines identified special handling of PAG waste as a groundwater mitigation measure.

5.7.2. PROPOSED SURFACE WATER MITIGATION

The information on surface water mitigation contained in the EISs was summarized and scored according to the following categories:

- No information available or no mitigation identified (0)
- Surface water monitoring (1)
- Stormwater, sediment, or erosion controls (2)
- Source controls not involving capture of water (including liners, adit plugging, caps/covers, leak detection systems, spill prevention measures and liming/blending/segregating of PAG materials) (3);
- Surface water/leachate capture and/or treatment (including settling, land application, routing of water, seepage collection) (4)
- Perpetual surface water capture and/or treatment (5)
- Surface water augmentation or replacement (6)

Table 5.16 lists the mines with mitigation that fell into the seven categories.

No Information Available or No Mitigation Identified

The EISs for eleven mines (15%) contained no information on surface water mitigation.

Table 5.16. Proposed Surface Water Mitigation

0		1		2		3		4		5		6	
No information available		Monitoring or characterization		Stormwater/sediment/erosion controls		Source controls without water capture		Surface water/leachate capture/treatment		In-perpetuity capture/treatment		Surface water augmentation/ replacement	
AJ Project	AK	Castle Mountain*	CA	Greens Creek*	AK	Kensington	AK	Greens Creek *	AK	Rock Creek	MT	Golden Sunlight*	MT
Fort Knox	AK	Hayden Hill	CA	Kensington Project	AK	Bagdad*	AZ	Kensington Project	AK	Zortman Landusky*	MT	Goldstrike	NV
Red Dog	AK	Jamestown*	CA	Pogo Project	AK	Morenci	AZ	Pogo Project	AK				
True North	AK	Mesquite*	CA	Red Dog-	AK	Sanchez	AZ	Yarnell	AZ				
Ray*	AZ	Grouse Creek*	ID	Bagdad*	AZ	American Girl*	CA	Jamestown*	CA				
Basin Creek	MT	Thompson	ID	Carlotta	AZ	Castle Mountain*	CA	McLaughlin*	CA				
East Boulder	MT	Black Pine*	MT	Cyprus Tohono	AZ	Imperial	CA	Stibnite	ID				
Mineral Hill*	MT	Rock Creek	MT	Morenci	AZ	Jamestown*	CA	Stone Cabin	ID				
Troy	MT	Stillwater*	MT	Safford (Dos	AZ	McLaughlin*	CA	Thompson Creek*	ID				
Copper Flat	NM	Zortman Landusky*	MT	Sanchez	AZ	Mesquite*	CA	Diamond Hill	MT				
Gilt Edge	SD	Dash	NV	Yarnell	AZ	Beartrack	ID	Golden Sunlight*	MT				
		Gold Quarry	NV	American Girl*	CA	Grouse Creek*	ID	Rock Creek	MT				
		Goldstrike	NV	Castle Mountain*	CA	Stibnite	ID	Zortman Landusky*	MT				
		Twin Creeks*	NV	Imperial	CA	Beal Mountain*	MT	Bald Mountain	NV				
				Jamestown*	CA	Black Pine*	MT	Gold Quarry	NV				
				McLaughlin*	CA	Rock Creek	MT	Jerritt Canyon*	NV				
				Mesquite*	CA	Stillwater*	MT	Marigold	NV				
				Royal Mountain King*	CA	Zortman Landusky*	MT	Rain	NV				
				Beartrack	ID	Bald Mountain	NV	Robinson (Ruth)	NV				
				Black Pine	ID	Battle Mountain	NV	Tyrone - Little	NM				
				Grouse Creek*	ID	Cortez	NV	Flambeau*	WI				
				Stibnite	ID	Cortez Pipeline	NV						
				Beal Mountain*	MT	Dash	NV						
				Black Pine*	MT	Florida Canyon*	NV						
				Montana Tunnels	MT	Jerritt Canyon*	NV						
				Montanore	MT	Lone Tree*	NV						
				Stillwater*	MT	Marigold	NV						
				Zortman Landusky*	MT	Pete	NV						
				Austin Gold	NV	Round Mountain*	NV						
				Bald Mountain	NV	Tyrone - Little	NM						
				Battle Mountain	NV	Lisbon Valley	UT						
				Cortez	NV	Flambeau*	WI						
				Dash	NV								
				Goldstrike	NV								
				Griffon	NV								
				Jerritt Canyon*	NV								
				Leeville	NV								
				Lone Tree*	NV								
				Marigold	NV								
				Mule Canyon	NV								
				Olinghouse	NV								
				Rain	NV								
				Robinson (Ruth)	NV								
				Rochester*	NV								
				Round Mountain*	NV								
				Ruby Hill*	NV								
				Trenton Canyon	NV								
				Twin Creeks*	NV								
				Lisbon Valley Copper	UT								
	11		14		49		32		21		2		0

Surface Water Monitoring

Fourteen (20%) of the mines identified monitoring as one of the proposed surface water mitigation.

Stormwater, Sediment or Erosion Controls

The largest number of mines (49 or 69%) proposed stormwater, sediment or erosion controls.

Source Controls Not Involving Capture of Water (including liners, adit plugging, caps/covers, leak detection systems, spill prevention measures and liming/blending/segregating of PAG materials)

Thirty two (45%) of the mines proposed source controls to protect surface water that included capping of dumps and tailings, stabilization measures, spill prevention measures and removal actions.

Surface Water/Leachate Capture and/or Treatment (including settling, land application, routing of water, seepage collection)

Nearly one-third of the mines (21 or 30%) proposed surface water or leachate capture and/or treatment as a surface water mitigation measure.

In Perpetuity Surface Water Capture and/or Treatment

Only two mines, (Rock Creek and Zortman and Landusky, MT) mentioned the possibility of perpetual treatment of surface water. In the case of Rock Creek it applies to the treatment of water discharging to the surface from the underground mine after plugging, if necessary, before the water is discharged to the Clark Fork River.

Surface Water Augmentation or Replacement

Only two mines mentioned the possibility of replacing or augmenting surface water: the Golden Sunlight Mine in Montana proposed supplying water sources for wildlife if the supply and quality of springs deteriorated; and the Goldstrike (Betze) Mine in Nevada proposed replacing or augmenting perennial surface flows if they were lost or decrease as a result of dewatering activities.

5.7.3. PROPOSED PIT WATER MITIGATION

The information on pit water mitigation contained in the EISs was summarized and scored according to one or more of the following categories:

- No information provided or none identified (0)
- Pit lake monitoring (1)
- Pit lake prevention (backfill, pumping, stormwater diversion, use in mine operation) (2)
- Treatment of pit water or backfill amendment (e.g., lime addition) (3)
- Not applicable: no pit lake will form (underground mine or pit above water table) (4)
- Contingency or research fund for pit lake, adaptive management (5)

Table 5.17 lists the mines with pit water mitigation that fell into the six categories.

No Information Provided or None Identified

Approximately one-quarter (19 or 27%) of the mines had no information on pit water quality mitigation; all of these mines had proposed open pits.

Table 5.17. Proposed Pit Water Mitigation

0		1		2		3		4		5	
No information available		Pit lake monitoring		Pit lake prevention (backfill, pumping, stormwater diversion, use in mine operation)		Treatment of pit water or backfill amendment (e.g. lime addition)		Not Applicable: no pit lake will form (underground mine or pit above water table)		Contingency or research fund for pit lake; adaptive management	
Fort Knox	AK	Castle Mountain*	CA	Bagdad*	AZ	Hayden Hill	CA	AJ Project	AK	Pipeline	NV
True North	AK	Grouse Creek*	ID	Carlotta	AZ	Stibnite	ID	Greens Creek*	AK	Goldstrike	NV
Red Dog	AK	Goldstrike	NV	Cyprus Tohono	AZ	Golden Sunlight*	MT	Kensington Project	AK		
Morenci	AZ	Round Mountain*	NV	Safford (Dos Pobres/San	AZ	Battle Mountain Phoenix	NV	Pogo Project	AK		
Ray*	AZ	Twin Creeks*	NV	Sanchez	AZ	Marigold	NV	American Girl*	CA		
Jamestown*	CA	Lisbon Valley Copper	UT	Yarnell	AZ	Flambeau*	WI	Black Pine*	MT		
McLaughlin*	CA			Castle Mountain*	CA			Diamond Hill	MT		
Mesquite*	CA			Hayden Hill	CA			East Boulder	MT		
Royal Mountain King*	CA			Imperial	CA			Mineral Hill*	MT		
Beartrack	ID			Black Pine	ID			Montanore	MT		
Thompson	ID			Grouse Creek*	ID			Rock Creek	MT		
Montana Tunnels	MT			Stibnite	ID			Stillwater*	MT		
Venture	NV			Stone Cabin	ID			Troy	MT		
Cortez	NV			Basin Creek	MT			Bald Mountain	NV		
Gold Quarry/ Maggie Creek	NV			Beal Mountain*	MT			Griffon	NV		
Mule Canyon	NV			Golden Sunlight*	MT			Jerritt Canyon*	NV		
Olinghouse	NV			Zortman	MT			Leeville	NV		
Robinson (Ruth)	NV			Bald Mountain	NV			Marigold	NV		
Copper Flat	NM			Phoenix	NV			Pete	NV		
				Dash	NV			Rain	NV		
				Florida Canyon*	NV			Rochester*	NV		
				Jerritt Canyon*	NV			Ruby Hill*	NV		
				Lone Tree*	NV			Trenton Canyon	NV		
				Marigold	NV						
				Pete	NV						
				Tyrone - Little	NM						
				Gilt Edge	SD						
				Flambeau*	WI						
	19		6		28		6		23		2

Pit Lake Monitoring

Monitoring of pit water quality was proposed at six (8%) of the mines. At two of these mines (Round Mountain and Twin Creeks) no other type of pit water quality mitigation was proposed.

Pit Lake Prevention (backfill, pumping, stormwater diversion, use in mine operation)

Pit lake prevention was identified at 28 (39%) of the mines; pit lake prevention measures included backfilling, pumping to prevent pit lake formation, stormwater diversion and use of pit water elsewhere in the mining operation.

Treatment of Pit Water or Backfill Amendment (e.g., lime addition)

Treatment of pit water or backfill amendment (e.g., lime addition) was identified at six (8%) of the mines.

Not Applicable: No Pit Lake Will Form (underground mine or pit above water table)

At approximately one-third (23 or 32%) of the 71 mines, no pit lake was expected to form, either because the mine was an underground mine or the bottom of the pit was above the water table.

Contingency or Research Fund for Pit Lake, Adaptive Management

At two of the mines, a contingency fund or research fund was proposed to address potential issues related to pit water quality. The Cortez Pipeline Mine in Nevada proposed adaptive management, because no mitigation measures appeared to be feasible for long-term potential environmental impacts and a contingency fund for monitoring and corrective action, should any be necessary. At the Goldstrike (Betze) Mine in Nevada, Barrick proposed to contribute $50,000 yearly, for a maximum of 10 years, to a college or university for conducting research related to water quality at inactive open pit mines.

5.7.4. PROPOSED WATER TREATMENT

The information on water treatment measures contained in the EISs was summarized and scored according to the following categories:

- No information provided or no water treatment measures identified (0)
- Solids or sediment settling ponds (1)
- Water treatment for cyanide (2)
- Water treatment for metals and/or acid drainage (3)
- Water treatment using non-conventional approaches (4)
- Perpetual water treatment (5)

Table 5.18 lists the mines with water treatment that fell into the six categories.

No Information Provided or No Water Treatment Measures Identified

Forty-eight (68%) of the mines provided no information on water treatment or no water treatment was proposed.

Solids or Sediment Settling Ponds

Six (8%) of the mines proposed settling of solids or sediment as a treatment method.

Water Treatment for Cyanide

Six (8%) of the mines proposed treatment for cyanide.

Water Treatment for Metals and/or Acid Drainage

Treatment for metals and/or acid drainage was proposed at 16 (23%) of the 71 NEPA mines.

Water Treatment Using Non-Conventional Approaches

Other types of treatment, including biological, land application, and passive approaches were proposed at 11 (15%) of the mines.

Water Treatment in Perpetuity

Perpetual treatment was specifically proposed, if necessary, at only four mines (Grouse Creek, ID; Golden Sunlight, Rock Creek and Zortman Landusky, MT).

Table 5.18. Proposed Water Treatment

0		1		2		3		4		5	
No information available/No treatment measures identified		Solids or sediment settling ponds		Water treatment for cyanide		Water treatment for metals and/or acid drainage		Water treatment using non-conventional approaches		Perpetual water treatment	
AJ Project	AK	Kensington Project	AK	Kensington Project	AK	Greens Creek*	AK	Beartrack	ID	Grouse Creek*	ID
Fort Knox	AK	Mineral Hill*	MT	Jamestown*	CA	Kensington Project	AK	Stibnite	ID	Golden Sunlight*	MT
True North	AK	Rock Creek	MT	Grouse Creek*	ID	Pogo Project	AK	Stone Cabin	ID	Rock Creek	MT
Bagdad*	AZ	Stillwater*	MT	Beal Mountain*	MT	Red Dog	AK	East Boulder	MT	Zortman and Landusky*	MT
Carlotta	AZ	Cortez Pipeline	NV	Lone Tree*	NV	Grouse Creek*	ID	Golden Sunlight*	MT		
Cyprus Tohono	AZ	Goldstrike	NV	Zortman and Landusky*	MT	Stone Cabin	ID	Mineral Hill*	MT		
Morenci	AZ					Golden Sunlight*	MT	Montanore	MT		
Ray*	AZ					Mineral Hill*	MT	Rock Creek	MT		
Safford	AZ					Montanore	MT	Stillwater*	MT		
Sanchez	AZ					Rock Creek	MT	Zortman and Landusky*	MT		
Yarnell	AZ					Zortman and Landusky*	MT	Lone Tree*	NV		
American Girl*	CA					Battle Mountain Phoenix	NV				
Castle Mountain*	CA					Goldstrike	NV				
Hayden Hill	CA					Lone Tree*	NV				
Imperial	CA					Twin Creeks*	NV				
McLaughlin*	CA					Flambeau*	WI				
Mesquite*	CA										
Royal Mountain King*	CA										
Black Pine	ID										
Thompson Creek*	ID										
Basin Creek	MT										
Black Pine*	MT										
Diamond Hill	MT										

Table 5.18. Proposed Water Treatment (Cont.).

0		1		2		3		4		5	
No information available/No treatment measures identified		Solids or sediment settling ponds		Water treatment for cyanide		Water treatment for metals and/or acid drainage		Water treatment using non-conventional approaches		Perpetual water treatment	
Montana Tunnels	MT										
Troy	MT										
Austin Gold Venture	NV										
Bald Mountain	NV										
Cortez	NV										
Dash	NV										
Florida Canyon*	NV										
Gold Quarry	NV										
Griffon	NV										
Jerritt Canyon*	NV										
Leeville	NV										
Marigold	NV										
Mule Canyon	NV										
Olinghouse	NV										
Pete	NV										
Rain	NV										
Robinson (Ruth)	NV										
Rochester*	NV										
Round Mountain*	NV										
Ruby Hill*	NV										
Trenton Canyon	NV										
Copper Flat	NM										
Tyrone-Little Rock	NM										
Gilt Edge	SD										
Lisbon Valley Copper	UT										
	48		6		6		16		11		4

5.8. PREDICTED WATER QUALITY IMPACTS

As noted in Section 5.5, this study distinguishes between potential and predicted water quality impacts. A predicted water quality impact is one that could occur after mitigation are in place. Predicted, or post-mitigation, impacts are considered by regulators when evaluating whether a proposed mine will meet applicable water quality standards. If a project predicts that waters of the state will not meet relevant standards as a result of the proposed activities, it is unlikely that the project will be approved. In general, very few EISs predicted that surface water and groundwater quality standards would not be met after mitigation were in place. Pit waters, on the other hand, are often not considered a water of the state, and under those conditions they are not necessarily required to meet Clean Water Act or Safe Drinking Water Act standards or criteria.

The elements of predicted water quality impacts reviewed in the 71 NEPA mine EISs include groundwater, surface water and pit water quality impacts.

5.8.1. PREDICTED GROUNDWATER QUALITY IMPACTS

The information on predicted groundwater quality impacts contained in the EISs was summarized and scored according to the following four categories:

- No information available (0)
- Low groundwater quality impacts (< relevant standards) (1)
- Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) (2)
- High groundwater quality impacts (>10 times relevant standards) (3)

For mines with multiple EISs, the EIS with the highest individual score for predicted groundwater impacts was used as the score for the mine. Scores for predicted groundwater impacts were often based on qualitative information or descriptions (e.g., "moderate" effects expected on groundwater quality). If an EIS entry noted anything regarding predicted groundwater quality that was negative, it was scored as a 2 (moderate impacts). Information on long-term groundwater quality impacts was also noted.

Table 5.19 lists the mines with predicted groundwater quality impacts that fell into in the four categories for predicted groundwater quality impacts.

No Information Available

No information was available on predicted groundwater quality impacts for 7 (10%) of the 71 NEPA mines. Two of the six mines had EAs rather than EISs (Royal Mountain King, CA (EIR-EA); Pete, NV). The Ray Mine in Arizona, which had a land-exchange EIS, acknowledged that mining will likely affect groundwater, but stated that a description of impacts was not possible because a detailed mine plan had not been developed. The East Boulder Mine in Montana predicted that nitrates from blasting agents and seepage from tailings impoundments could enter groundwater, but no estimates were made about potential impacts on groundwater. As noted in section 5.5, the Montana Tunnels Mine in Montana predicted that poor quality water would seep from the pit to groundwater in 480 years, but no estimates were made of the impact on groundwater.

Low Groundwater Quality Impacts

The majority of the mines (56 or 79%) predicted that groundwater quality impacts would be low and below relevant standards. A number of mines mentioned that there would be no impacts to groundwater outside of the mine area or of mixing zones, implying that groundwater on site would be impacted by the proposed actions. A number of the other mines stated that some combination of large depths to groundwater, the presence of neutralizing rock, and proposed mitigation measures would ensure that groundwater quality would not be impacted.

Moderate Groundwater Quality Impacts

Four mines (6%) predicted moderate groundwater quality impacts, exceeding water quality standards by up to 10 times, after mitigation were in place. Thompson Creek Mine in Idaho mentioned the potential for seepage from tailings impoundments and waste rock dumps to groundwater escaping the seepage control system, resulting in moderate groundwater impacts. The Tyrone Mine mentioned an existing groundwater plume from the stockpile and exceedence of the fluoride standard. The Cortez Pipeline Mine in Nevada predicted low groundwater quality impacts from proposed facilities but stated that the quality of reinfiltration of dewatering water may be degraded by soluble constituents in previously unsaturated alluvium. The Marigold Mine in Nevada predicted that escape of constituents from the heap leach pad could degrade groundwater quality.

Table 5.19. Predicted Groundwater Quality Impacts

0		1		2		3	
No information available		Low		Moderate		High	
AJ Project	AK	Fort Knox	AK	Thompson Creek*	ID	Pogo Project	AK
Red Dog	AK	Greens Creek*	AK	Tyrone Little Rock	NM	McLaughlin*	CA
Ray*	AZ	Kensington Project	AK	Cortez Pipeline	NV	Zortman and Landusky*	MT
Royal Mountain King*	CA	True North	AK	Marigold	NV	Golden Sunlight*	MT
East Boulder	MT	Bagdad*	AZ				
Montana Tunnels	MT	Carlotta	AZ				
Pete	NV	Cyprus Tohono	AZ				
		Morenci	AZ				
		Safford (Dos Pobres)	AZ				
		Sanchez	AZ				
		Yarnell	AZ				
		American Girl*	CA				
		Castle Mountain*	CA				
		Hayden Hill	CA				
		Imperial	CA				
		Jamestown*	CA				
		Mesquite	CA				
		Beartrack	ID				
		Black Pine	ID				
		Grouse Creek*	ID				
		Stibnite	ID				
		Stone Cabin	ID				
		Basin Creek	MT				
		Beal Mountain*	MT				
		Black Pine*	MT				
		Diamond Hill	MT				
		Mineral Hill*	MT				
		Montanore	MT				
		Rock Creek	MT				
		Stillwater*	MT				
		Troy	MT				
		Copper Flat	NM				
		Austin Gold Venture	NV				
		Bald Mountain	NV				
		Battle Mountain Phoenix	NV				
		Cortez	NV				
		Dash	NV				
		Florida Canyon	NV				

For predicted impacts (considering effects of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

Table 5.19. Predicted Groundwater Quality Impacts (continued)

0		1		2		3	
No information available		Low		Moderate		High	
		Gold Quarry	NV				
		Goldstrike	NV				
		Griffon	NV				
		Jerritt Canyon	NV				
		Leeville	NV				
		Lone Tree	NV				
		Mule Canyon	NV				
		Olinghouse	NV				
		Rain	NV				
		Robinson (Ruth)	NV				
		Rochester	NV				
		Round Mountain	NV				
		Ruby Hill	NV				
		Trenton Canyon	NV				
		Twin Creeks	NV				
		Gilt Edge	SD				
		Lisbon Valley	UT				
		Flambeau	WI				
	7		56		4		4

For predicted impacts (considering effects of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

High Groundwater Quality Impacts

Four of the 71 NEPA mines predicted high groundwater quality impacts after mitigation were considered. The Pogo Mine in Alaska predicted increases in arsenic (of up to 500 µg/l) and cyanide concentrations in alluvial groundwater from the underground mine, even after plugging and backfilling. The McLaughlin Mine in California predicted that seepage from the tailings facility would result in permanent degradation of local groundwater and noted the potential for shallow groundwater to flowing toward Hunting Creek. The McLaughlin EIS stated that the local groundwater was not connected to the regional system, so water supplies would not be impacted. A cyanide plume (from tailings seepage) already existed at the Golden Sunlight Mine in Montana when the 1997 EIS was written. The EIS stated that seepage from the tailings impoundment and one of the waste rock complexes would require perpetual treatment. The 2001 Zortman and Landusky Mines EIS predicted that concentrations of most contaminants from the Zortman and Landusky Mines would increase over time, and pit backfill would increase contaminant loads in the short term. The 1996 EIS predicted that acid and metal concentrations in toe seeps could increase or, at best, remain roughly unchanged for the first few years after capping.

Long-term Groundwater Quality Impacts

Several mines predicted groundwater impacts that would be long-term or that would not occur for years into the future. The Pogo Mine in Alaska predicted that increases in arsenic and total dissolved solids would occur from the underground mine over the long-term (hundreds to thousands of years), after plugging and backfilling after mine closure. The McLaughlin Mine in California predicted that the proposed tailings facility would allow 40 gpm of seepage into local groundwater, and this impact would be long term, resulting in permanent degradation of the local groundwater. The 1997 Golden Sunlight EIS predicted that seepage from Tailings Impoundment No.2 and West Waste Rock Complex would require perpetual treatment. At the Montana Tunnels Mine, as noted in Section 5.5, poor quality water was not expected to seep out of the pit and discharge to groundwater (at 15 gpm) until 480 years later when water levels in the pit reached equilibrium.

The 2001 Zortman and Landusky EIS predicted that backfilling would increase loads of contaminants in the short term, but that in the long term, removing waste rock would have a positive impact on groundwater quality. The Battle

Mountain Complex EIS noted that there was a potential for long-term impacts to groundwater quality during the post-closure period, but that with the contingent long-term groundwater management plan, significant impacts to groundwater were not expected.

5.8.2. PREDICTED SURFACE WATER IMPACTS

The EIS information on predicted surface water quality impacts was summarized and scored according to the following four categories:

- No information available (0)
- Low surface water quality impacts (< relevant standards) (1)
- Moderate surface water quality impacts (≥ and up to 10 times relevant standards) (2)
- High surface water quality impacts (>10 times standards) (3)

For mines with multiple EISs, the EIS with the highest individual score for predicted surface water impacts was used as the score for the mine. Scores for predicted surface water impacts were often based on qualitative information or descriptions (e.g., no impacts expected on surface water quality). If an EIS entry noted anything regarding predicted surface water quality that was negative, including sedimentation or erosion effects on surface water, it was scored as a 2 (moderate impacts). Information on long-term surface water quality impacts was also discussed.

Table 5.20 lists the mines with predicted surface water impacts in each of the four categories.

No Information Available

No information was available on predicted surface water quality impacts for six (8%) of the mines. Two of these mines (Royal Mountain King, CA; True North, AK) had EAs rather than EISs, and the Ray Mine in Arizona had a land-exchange EIS. The Diamond Hill Mine in Montana mentioned weathering of sulfides and the Dash Mine in Nevada mentioned soil loss, but neither contained specifics on surface water quality predictions. The Montana Tunnels Mine in Montana mentioned destruction of springs and decreased flows in streams, and as discussed in the surface water quality potential section. Poor-quality water was expected to seep out of the pit in 480 years, but the impact on surface water quality was not mentioned.

Low Surface Water Quality Impacts (water quality standards not exceeded)

The vast majority (57 or 80%) of the mines predicted that surface water quality impacts would be low or non-existent. As for predicted groundwater quality impacts, mines that predicted low surface water quality impacts mentioned the effects of mixing zones, implying that surface water would be impacted by the proposed actions but dilution would reduce concentrations to below standards. Other mines stated that some combination of distance to or low amount of surface water, low potential for acid drainage or contaminant leaching, and proposed mitigation or management measures would ensure that surface water quality would not be impacted.

Moderate Surface Water Quality Impacts (≥ and up to 10 times relevant standards)

Seven (10%) of the mines predicted that surface water quality impacts would be moderate, exceeding relevant standards by up to 10 times, where specific water quality conditions were mentioned. The Pogo Project EIS predicted moderate impacts to Liese Creek from tailings during mining operations. Modeling conducted for the McLaughlin Mine EIS in California predicted that arsenic, nickel, zinc, silver, iron and copper concentrations would not exceed drinking water standards in Hunting Creek but that manganese would slightly exceed its standard. The EIS for the Beartrack Mine in Idaho predicted exceedence of zinc standards in one reach of Napias Creek, and the Thompson Creek Mine in Idaho predicted exceedence of aquatic life criteria in Bruno Creek during low-flow conditions from tailings infiltration. The Olinghouse Mine in Nevada predicted reduction in discharge and sedimentation impacts to surface water.

Table 5.20. Predicted Surface Water Quality Impacts

0		1		2		3	
No information available		Low		Moderate		High	
True North	AK	AJ Project	AK	Pogo Project	AK	Zortman and Landusky*	MT
Ray*	AZ	Fort Knox	AK	McLaughlin*	CA		
Royal Mountain King*	CA	Greens Creek *	AK	Beartrack	ID		
Diamond Hill	MT	Kensington Project	AK	Thompson Creek*	ID		
Montana Tunnels	MT	Red Dog	AK	Tyrone Little Rock	NM		
Dash	NV	Bagdad*	AZ	Marigold	NV		
		Carlotta	AZ	Olinghouse	NV		
		Cyprus Tohono	AZ				
		Morenci	AZ				
		Safford (Dos Pobres)	AZ				
		Sanchez	AZ				
		Yarnell	AZ				
		American Girl*	CA				
		Castle Mountain*	CA				
		Hayden Hill	CA				
		Imperial	CA				
		Jamestown*	CA				
		Mesquite*	CA				
		Black Pine	ID				
		Grouse Creek*	ID				
		Stibnite	ID				
		Stone Cabin	ID				
		Basin Creek	MT				
		Beal Mountain*	MT				
		Black Pine*	MT				
		East Boulder	MT				
		Golden Sunlight*	MT				
		Mineral Hill*	MT				
		Montanore	MT				
		Rock Creek	MT				
		Stillwater*	MT				
		Troy	MT				
		Copper Flat	NM				
		Austin Gold Venture	NV				
		Bald Mountain	NV				
		Battle Mountain Phoenix	NV				
		Cortez	NV				
		Cortez Pipeline	NV				
		Florida Canyon*	NV				

For predicted impacts (considering effects of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

Table 5.20. Predicted Surface Water Quality Impacts (continued)

0		1		2		3	
No information available		Low		Moderate		High	
		Gold Quarry	NV				
		Goldstrike	NV				
		Griffon	NV				
		Jerritt Canyon*	NV				
		Leeville	NV				
		Lone Tree*	NV				
		Mule Canyon	NV				
		Pete	NV				
		Rain	NV				
		Robinson (Ruth)	NV				
		Rochester*	NV				
		Round Mountain*	NV				
		Ruby Hill*	NV				
		Trenton Canyon	NV				
		Twin Creeks*	NV				
		Gilt Edge	SD				
		Lisbon Valley	UT				
		Flambeau*	WI				
	6		57		7		1

For predicted impacts (considering effects of mitigation): Low = < water quality standards; Moderate = predicted to exceed water quality standards by 1 - 10 times; High = predicted to exceed water quality standards by > 10 times.

High Surface Water Quality Impacts

One mine (Zortman and Landusky, MT) predicted high surface water quality impacts as a result of mining, even after mitigation were considered. Some irreversible impacts to the surface water quality were expected from the leach pad and from other mine features such as waste rock and open pits even though current water quality was already poor.

Long-term Surface Water Quality Impacts

A number of mines mentioned the effect of time on predicted surface water quality impacts. The EIS for the Greens Creek Mine in Alaska predicted a lag time for acid generation in tailings of 20 to 50 years. The EIS for the Pogo Mine in Alaska predicted that after closure of the dry stack tailings, water quality would improve. Although surface water quality impacts were predicted to be low at the Grouse Creek Mine in Idaho, the EIS mentioned that if acid drainage occurs, the effects could be long-term. The Beal Mine in Montana was predicted to have both long and short-term environmental effects in German Gulch, but the effects were not predicted to be significant in terms of either areal extent or severity.

As mentioned above, poor-quality water was not expected to seep out of the pit at the Montana Tunnels Mine in Montana until pit water levels equilibrate in 480 years, but the impact on water quality in Spring Creek was unknown. Long-term surface water quality impacts were not expected at the Zortman and Landusky Mine in Montana because pad water at the bottom of one of the Landusky leach pads, although predicted to become acid over time, would be contained on a liner. Water quality impacts in the northern drainages were predicted to increase if acid-generating material was placed as pit backfill in the headwaters of these drainages. For a mine expansion proposal initially approved in 1996 at the Zortman Mine, improved water quality was predicted over time as a result of reduced constituent loads in Ruby and Carter Gulch due to removal of the Alder Gulch waste rock dump, the Ruby Gulch tailings, the proposed sorting of backfill, and effective reclamation of the Zortman pit complex. This Zortman mine expansion never occurred and was withdrawn by the operator subsequent to bankruptcy. Water quality impacts to surface water from sulfate were predicted to occur at the Golden Sunlight Mine in Montana but not for 500 years or more.

A number of mines mentioned the effect of time on predicted surface water quality impacts. The EIS for the Greens Creek Mine in Alaska predicted a lag time for acid generation in tailings of 20 to 50 years. The EIS for the Pogo, Alaska, Mine predicted that after closure of the dry stack tailings, water quality would improve. Although surface water quality impacts were predicted to be low at the Grouse Creek Mine in Idaho, the EIS mentioned that if acid drainage occurs, the effects could be long-term. The Beal Mine in Montana was predicted to have both long and short-term environmental effects in German Gulch, but the effects were not predicted to be significant in terms of either areal extent or severity. As mentioned above, poor-quality water was not expected to seep out of the pit at the Montana Tunnels Mine until pit water levels equilibrate in 480 years, but the impact on water quality in Spring Creek was unknown.

5.8.3. PREDICTED PIT WATER IMPACTS

The information on predicted pit water quality impacts was summarized and scored according to the following five categories:

- No information available (0)
- Low pit water quality impacts (concentrations less than relevant standards or water quality similar to surrounding groundwater) (1)
- Moderate pit water quality impacts (≥ and up to 10 times relevant standards) (2)
- High pit water quality impacts (>10 time relevant standards) (3)
- No pit lake or long-term standing water expected (underground mine or pit above the water table) (4)

For mines with multiple EISs, the EIS with the highest individual score (1, 2, or 3) for predicted pit water impacts were used as the score for the mine. Scores for predicted pit water impacts were often based on qualitative information or descriptions (e.g., pit water quality expected to be poor). If an EIS entry noted anything regarding predicted pit water quality that was negative, it was scored as a 2 (moderate impacts). If the pit was proposed to be backfilled but the EIS did not address backfill water quality, it was scored as a 0. For mines with multiple proposed pits, the pit with the highest score (1, 2, 3, or 4) was used to score the mine as a whole. Information on long-term pit water quality impacts and the need for perpetual treatment are also discussed.

Table 5.21 lists the mines with predicted pit water quality impacts in each of the five categories.

No Information Available

Twelve (17%) of the mines provided no information on predicted pit water quality. Four of the mines (True North, AK; Royal Mountain King, CA (EIR-EA); Black Pine, ID; Austin Gold Venture, NV) had EAs rather than EISs, and the Morenci and Ray mines in Arizona had land-exchange EISs.

Low Pit Water Quality Impacts

EISs for 12 (17%) of the mines predicted pit water quality would be acceptable for all potential uses, either by being below water quality standards or having a composition similar to surrounding groundwater. Of these, only one (Safford, AZ) conducted pit lake water quality modeling. The Safford Project had high potential (pre-mitigation) pit water quality impacts. The designation as high related predominantly to poor water quality in an existing pit lake.

Two other mines (Grouse Creek and Thompson Creek, ID) had moderate potential pit water quality impacts, and the others in this category all had low potential pit water quality impacts. The main reason given for predicting low pit water quality impacts was the presence of low acid drainage and/or contaminant leaching potential in the pit rather than improvements from any mitigation measures. However, the Lisbon Valley Mine in Utah predicted high potential (pre-mitigation) pit water quality impacts, but dilution from diverted surface runoff was predicted to improve water quality to better than existing groundwater conditions.

Table 5.21. Predicted Pit Water Quality

0		1		2		3		4	
No information available		Low		Moderate		High		No pit lake expected to form (pit above water table or no pit)	
True North	AK	Fort Knox	AK	Sanchez	AZ	McLaughlin*	CA	AJ Project	AK
Red Dog	AK	Safford (Dos Pobres)	AZ	Jamestown*	CA	Golden Sunlight	MT	Greens Creek *	AK
Bagdad*	AZ	Yarnell	AZ	Mesquite*	CA	Montana Tunnels	MT	Kensington Project	AK
Carlotta	AZ	Castle Mountain*	CA	Beartrack	ID	Zortman Landusky*	MT	Pogo Project	AK
Morenci	AZ	Imperial	CA	Copper Flat	NM	Gold Quarry	NV	Cyprus Tohono	AZ
Ray*	AZ	Grouse Creek*	ID	Tyrone Little Rock	NM	Lone Tree*	NV	American Girl*	CA
Royal Mountain King*	CA	Stibnite	ID	Bald Mountain	NV	Twin Creeks*	NV	Hayden Hill	CA
Black Pine	ID	Thompson Creek*	ID	Battle Mountain Phoenix	NV	Gilt Edge	SD	Black Pine*	MT
Stone Cabin	ID	Basin Creek	MT	Cortez Pipeline	NV	Flambeau*	WI	Diamond Hill	MT
Austin Gold Venture	NV	Beal Mountain*	MT	Goldstrike	NV			East Boulder	MT
Dash	NV	Pete	NV	Marigold	NV			Mineral Hill*	MT
Florida Canyon*	NV	Lisbon Valley	UT	Olinghouse	NV			Montanore	MT
				Mule Canyon	NV			Rock Creek	MT
				Robinson (Ruth)	NV			Stillwater*	MT
				Round Mountain*	NV			Troy	MT
								Cortez	NV
								Griffon	NV
								Jerritt Canyon*	NV
								Leeville	NV
								Rain	NV
								Rochester*	NV
								Ruby Hill*	NV
								Trenton Canyon	NV
	12		12		15		9		23

Moderate Pit Water Quality Impacts

Moderate pit water quality impacts were predicted for 15 (21%) of the mines. A number of the mines in this category mentioned the effect of evapoconcentration on pit water quality. Six of the mines in this category conducted pit lake modeling to estimate pit water quality (Mesquite, CA; Cortez Pipeline, Goldstrike, Olinghouse, Robinson (Ruth) and Round Mountain, NV). The Robinson (Ruth), Nevada, EIS mentioned some improvements in water quality resulting from removal of mineralization from mining of the pit.

High Pit Water Quality Impacts

High pit water quality impacts were predicted at nine (13%) of the mines. Five mines in this category modeled pit lake or pit backfill leachate water quality (Gold Quarry, Lone Tree and Twin Creeks, NV; Gilt Edge, SD; Flambeau, WI). The McLaughlin Mine in California expected pit water with high concentrations of metals, even though neutralizing material was present in the pit. The Golden Sunlight Mine in Montana noted the need for perpetual treatment of pit water. The Zortman and Landusky Mine in Montana predicted that backfilling the pit would increase concentrations, at least initially, but that sulfide oxidation could be slowed by backfilling. Pit water quality at the Gold Quarry Mine in Nevada was predicted to exceed concentrations of metals by over 10 times but ultimately to be similar to surrounding groundwater quality. As discussed below, a number of the mines that used modeling to predict pit water quality predicted changing water quality over time in the pit lake or backfill. At the Twin Creeks Mine in Nevada, hydrogeochemical pit lake modeling predicted that antimony, arsenic and thallium would exceed drinking water standards (antimony and arsenic by over 10 times) for the life of the pit but that aluminum concentrations would only be exceeded for the first 27 years until the lobes of the pit lakes merged. The model also predicted that there would be no net outflow to groundwater or surface water.

No Pit Lake or Long-Term Standing Water Expected

Almost one-third (23 or 32%) of the mines predicted that pit water (either in a pit lake or in backfill) would not be present, either because it was an underground mine or because the bottom of the pit would be above the water table. The following mines in this category are all expected to have open pits or backfilled open pits, but the bottom of the pits are predicted to be above the water table: Cyprus Tohono, Arizona; American Girl and Hayden Hill, California; and all the Nevada mines except Leeville, which is an underground mine. The remainder of the mines listed in this category in Table 5.21, including the Leeville Mine in Nevada, are underground mines.

Long-term Pit Water Quality Impacts in Long-Term

A number of mines predicted that pit water quality impacts would occur in the long-term or change over time. A number of the mines that used hydrogeochemical models to predict pit water quality reported predicted changes in water quality over time. For example, in Nevada, the Cortez Pipeline Mine predicted good pit water quality initially, with drinking water standards not exceeded until ~190 years after the end of mining and migration of pit waters into adjacent aquifers more than 250 years after end of mining. Also in Nevada, the Goldstrike Mine pit water was predicted to exceed, in the long term, the drinking water standard for arsenic, cadmium, fluoride, iron, lead, and TDS. Similarly, at the Lone Tree Mine in Nevada, pit lake water quality was predicted to be acidic initially but become neutral after 10 years, exceeding drinking water standards for arsenic and sulfate before it becomes neutral. Cadmium would exceed drinking water standards for only one year, and for nickel, fluoride and antimony exceedence would happen only after 25 years. At the Twin Creeks Mine in Nevada, hydrogeochemical pit lake modeling predicted that antimony, arsenic, and thallium would exceed drinking water standards (antimony and arsenic by over ten times) for the life of the pit but that aluminum concentrations would only be exceeded for the first 27 years until the lobes of the pit lakes merged. The model also predicted that there would be no net outflow to groundwater or surface water. Long-term pit water quality was predicted by modeling to be poor at the Gilt Edge Mine in South Dakota. Zinc and arsenic concentrations were predicted to increase to 8.5 and 1.05 mg/l respectively, by year five after pit closure, and copper concentrations were expected to increase to 0.4 by year 34.

Perpetual Treatment Required

Mines in Montana made long-term pit water quality predictions without modeling, with the Golden Sunlight Mine predicting that water entering or in the pit would require perpetual treatment. The Montana Tunnels, Montana, Mine pit water was predicted to be initially acidic with elevated concentrations of heavy metals, but as the pit continued to fill with water, pyrite oxidation rates were expected to diminish with burial of the diatreme. Finally, at the Zortman and Landusky Mine, pit backfilling was expected to increase loads of contaminants in the short term due to the disturbance of acid generating material, the re-establishment of flowpaths and mobilization of soluble oxidation products.

Proposed Action Would Improve Pit Water Quality

The Lisbon Valley Mine in Utah predicted high potential (pre-mitigation) pit water quality impacts, but dilution from diverted surface runoff was predicted to improve water quality to better than the existing groundwater conditions.

One mine, (Robinson (Ruth), NV) predicted improvement of pit water quality as a result of the proposed actions. Some improvement in pit (Liberty and Ruth pits) water was expected as mineralization is removed by mining. Further, to the extent that acidic solutions were discharged into the pit during historic leaching activities, pit dewatering and subsequent refilling will also result in improved water quality.

5.9. DISCHARGE INFORMATION

In many cases, EISs identified mines or certain facilities at mines (e.g., heap leach pads or tailings impoundments) as "zero discharge" facilities. There is some debate about the meaning of "zero discharge," because discharges can occur as spills or leaks from liners, despite design requirements. For the purposes of this analysis, a "zero discharge" facility is defined by the design goal rather than the actual performance.

Many mines also have discharges to surface water that are regulated by either federal National Pollution Discharge Elimination System (NPDES) permits or similar permits issued by individual states under EPA authority. EPA classifies larger, more regulated facilities as "major" facilities and smaller facilities as "minor" facilities. These discharges can be treated or untreated, depending on the concentrations in the discharge water.

A smaller number of mines discharge to groundwater, typically through re-infiltration basins, which is a form of land application. Often the water discharged to groundwater is mine or pit dewatering water. Land application or infiltration basins are considered a form of treatment, so technically, all water discharged to groundwater using these methods is treated. It is also possible to re-inject mine water to groundwater through deep wells. However, no mines reviewed used this type of groundwater discharge.

Table 5.22 lists the mines described in EISs as zero discharge facilities and those that propose to discharge to surface water and groundwater. Note that the total number of mines does not add to 71 because a number of the mines do not have surface water or groundwater discharges and are also not zero-discharge facilities.

Zero Discharge Facilities

Twenty-eight (39%) of the mines had proposed zero-discharge designs for at least some of their facilities. Tailings, heap leach, open pits, mills and dams were described as being zero-discharge facilities. Open pits were described as being "zero discharge" facilities if they did not discharge to groundwater and instead acted as a groundwater sink. Using these definitions, mines with individual "zero discharge" facilities could still require a NPDES permit.

Table 5.22. Discharge Information

1		2		3	
Zero Discharge Facility		Discharge to Surface Water		Discharge to Groundwater	
AJ Project	AK	AJ Project	AK	Stillwater*	MT
Fort Knox	AK	Greens Creek*	AK	Cortez Pipeline	NV
Cyprus Tohono	AZ	Kensington Project	AK	Leeville	NV
Morenci	AZ	Pogo Project	AK	Twin Creeks*	NV
Safford (Dos Pobres)	AZ	Red Dog	AK		
American Girl*	CA	Bagdad*	AZ		
Castle Mountain*	CA	Carlotta	AZ		
Hayden Hill	CA	Morenci	AZ		
Jamestown*	CA	Ray*	AZ		
Grouse Creek*	ID	Safford (Dos Pobres)	AZ		
Stibnite	ID	McLaughlin*	CA		
Thompson Creek*	ID	Beartrack	ID		
Beal Mountain*	MT	Thompson Creek*	ID		
Black Pine*	MT	Basin Creek	MT		
Mineral Hill*	MT	Beal Mountain*	MT		
Stillwater*	MT	East Boulder	MT		
Austin Gold Venture	NV	Mineral Hill*	MT		
Battle Mountain Phoenix	NV	Montana Tunnels	MT		
Cortez	NV	Montanore	MT		
Cortez Pipeline	NV	Rock Creek	MT		
Florida Canyon*	NV	Stillwater*	MT		
Griffon	NV	Zortman and Landusky*	MT		
Marigold	NV	Gold Quarry	NV		
Mule Canyon	NV	Goldstrike	NV		
Robinson (Ruth)	NV	Lone Tree*	NV		
Round Mountain*	NV	Twin Creeks*	NV		
Ruby Hill*	NV	Gilt Edge	SD		
Twin Creeks*	NV	Flambeau*	WI		
	28		28		4

Surface Water Discharges

Twenty-eight (39%) of the mines proposed discharging to surface water, and all but one of these (Leeville, NV) had NPDES permits. Of the 28 mines with NPDES permits, ten are major and 13 are minor facilities. For the Leeville Mine, dewatering water was proposed to be disposed of in re-infiltration basins, but if that does not provide sufficient volume, the EIS stated that the dewatering water could be discharged to the Humboldt River. It is notable that eight mines described as zero discharge facilities (AJ, AK; Morenci and Stafford, AZ; Thompson Creek, ID; Beal Mountain, Mineral Hill, and Stillwater, MT; Twin Creeks, NV) also have NPDES permits. In those cases, particular facilities may be identified as "zero discharge" (e.g., heap leach or tailings facility), and/or the NPDES permits are for stormwater and pit dewatering and are not related to the discharge of pollutants.

Groundwater Discharges

Four mines (Stillwater, MT; Cortez Pipeline, Leeville, and Twin Creeks, NV) proposed to discharge to groundwater. At the Stillwater Mine, adit water was proposed to be land applied. At the three Nevada mines, dewatering water was proposed to be discharged to groundwater through re-infiltration basins.

5.10. GENERAL RELATIONSHIPS AMONG ENVIRONMENTAL CHARACTERISTICS IN THE NEPA DOCUMENTS

Sections 5.2 to 5.9 presented the general findings on information in the EISs for the 71 NEPA mines reviewed in detail. In this Section, the relationships among environmental characteristics identified in the NEPA documents for these mines are examined. These characteristics include:

- geology and mineralization
- acid drainage potential
- contaminant leaching potential
- climate
- proximity to water resources

This section examines, for example, if there is a relationship between geology and mineralization and identified acid drainage potential, or between climate and identified proximity to water resources. The study also examines whether there is a relationship between factors such as acid drainage potential and the identified potential for water quality impacts. In theory, there should be a relationship between mineralogy and acid drainage potential, between climate and depth to groundwater, and among these factors and the likelihood that water resources will be impacted.

5.10.1. GEOCHEMICAL CHARACTERISTICS: GEOLOGY/MINERALIZATION, ACID DRAINAGE POTENTIAL, AND CONTAMINANT LEACHING POTENTIAL

In a number of cases, little information was available in the EISs on rock type or mineralization. Geologic and mineralogic information available in the EISs was generally insufficient to make even general predictions about contaminant leaching potential based on mineralogy (e.g., identification of arsenic-containing minerals).

Some of the more notable mines, for which no or insufficient information was available in the NEPA documents, are listed below.

- The Pogo Project in Alaska, which EIS otherwise might be considered one of the more complete and comprehensive from a water quality predictions standpoint.
- Jamestown, McLaughlin and Royal Mountain King mines in California, had EISs that were conducted as part of California's EIR process and have subsequently resulted in contaminant leaching that could have been identified mineralogically.
- The Austin Gold Venture and Rain mines in Nevada where new project permitting was conducted using EAs and contaminant leaching has occurred that could have been predicted from knowing the mineralogy.

In many cases, mines identified with low-sulfide content may be based on insufficient characterization applied to the EIS. For example, Jerritt Canyon's EIS indicates low sulfide content, but the fact that the ore requires roasting before leaching indicates that relatively high sulfide and/or carbon content is present in the ore. Six mines had no information on acid drainage potential, and 15 mines had no information on contaminant leaching potential.

The identification of geology and mineralization, as currently conducted in EISs, is generally a blunt tool for predicting water quality impacts. Geologic and mineralogic information is usually focused on the ore body rather than on all mined materials that could potentially impact water resources. There were relatively weak relationships between geology, mineralization or ore association and acid drainage potential. Mineralization scores that favored acid drainage development (three to five: moderate to high sulfide contents with or without neutralizing material) generally had higher scores for acid drainage potential. However, 50% (nine of 18) of mines that had mineralization/ore associations of four (sulfides present, no associated carbonates) and five (high sulfide content, carbonates low/not present) reported low acid drainage potential. The reasons for the low acid drainage potential scores may be related to different rocks being evaluated for mineralization and acid drainage potential or to other factors that were considered by the mine in determining the potential for acid drainage. However, the discrepancy or

lack of good agreement between identified mineralization and acid drainage potential highlights the importance of coordinating mineralogic and acid drainage potential evaluations in the NEPA process. As noted in the companion report (Maest et al., 2005), the same geochemical test units should be used for testing of all parameters used to predict water quality impacts. In addition, more extensive information on mineralogy and mineralization should be included in EISs. Similarly, there was a weak relationship between mineralization and contaminant leaching potential. Of the 18 mines that identified moderate to high sulfides present and little neutralization potential, seven (39%) identified low contaminant leaching potential. In general, rocks with higher sulfide content are expected to leach higher concentrations of contaminants, especially heavy metals.

Although the relationship between acid drainage potential and contaminant leaching potential is not necessarily good, wastes that develop acid drainage usually have high concentrations of other contaminants as well, especially heavy metals. Only four mines identified a high acid drainage potential (Black Pine, Golden Sunlight, and Zortman and Landusky, MT; Battle Mountain Complex, NV). None of these four mines identified a low contaminant leaching potential. However, of the 19 mines that identified a moderate acid drainage potential, seven (37%) identified a low contaminant leaching potential. Twelve mines identified a high contaminant leaching potential. It is possible to have a high contaminant leaching potential and a low acid drainage potential, because acidic conditions are not a requirement for contaminant leaching. Only two mines identified high acid drainage and contaminant leaching potential: Golden Sunlight in Montana, and the Battle Mountain Complex in Nevada. Zortman and Landusky identified both high acid drainage and contaminant leaching potential, but not until the fourth EIS/EA in 2001.

Fourteen mines identified both moderate to high acid drainage and contaminant leaching potential. In theory, these mines should also identify a higher potential for water quality impacts (recall that "potential" refers to pre-mitigation conditions). Ten of these 14 mines (71%) also identified a moderate to high potential for surface water and groundwater quality impacts. However, only one of the 14 mines predicted moderate or high surface water quality impacts post-mitigation (Zortman and Landusky, MT). Only two of the 14 identified moderate or high groundwater quality impacts (Zortman and Landusky and Golden Sunlight, MT). Therefore, even though a high proportion of the mines link geochemical characteristics to water quality, the vast majority declare in EISs that mitigation measures will prevent water quality impacts.

5.10.2. HYDROLOGIC AND CLIMATIC CHARACTERISTICS

Relationship between Proximity to Surface Water and Depth to Groundwater

Based on the data in Section 5.4, hydrology, the surface water and groundwater classifications are compared in Table 5.23. The data indicate that extreme differences in proximity to groundwater and surface water rarely exist. Mines with deep groundwater generally also are located far from surface water resources, and mines with shallow groundwater also are located close to surface water resources. However, some variability within the various classifications does exist (e.g., springs may exist in desert areas with no perennial streams, and deep groundwater may still result in discharges directly to surface water – typically from mine dewatering).

Table 5.23. Comparison of Surface Water and Groundwater Hydrology Classifications for the 71 NEPA Mines Reviewed in Detail

		Groundwater Hydrology Classification							
		No information provided		Depth to groundwater > 200 ft		Depth to groundwater < 200 ft but > 50 ft		Depth to groundwater 0-50 ft and/or springs on site	
Surface Water Hydrology Classification	No information provided	Imperial	CA	Rain	NV			Yarnell	AZ
		Royal Mountain King	CA					Diamond Hill	MT
	Intermittent/ephemeral streams on site-perennial streams > 1 mile away	Copper Flat	NM	Castle Mountain	CA	Cyprus Tohono	AZ	Bagdad	AZ
				Bald Mountain	NV	Mesquite	CA	Safford (Dos Pobres)	AZ
				Cortez Pipeline	NV	Black Pine	ID	Sanchez	AZ
				Griffon	NV	Lisbon Valley	UT	American Girl	CA
				Olinghouse	NV			Cortez	NV
								Florida Canyon	NV
								Gold Quarry	NV
								Lone Tree	NV
	Intermittent/ ephemeral streams on site - perennial streams <1 mile away	True North	AK	Leeville	NV	Marigold	NV	McLaughlin	CA
		Austin Gold Venture	NV	Ruby Hill	NV	Pete	NV	Golden Sunlight	MT
						Round Mountain	NV	Montana Tunnels	MT
								Stillwater	MT
								Battle Mountain Phoenix	NV
								Goldstrike	NV
								Robinson (Ruth)	NV
								Rochester	NV
								Flambeau	WI
	Perennial streams on site	AJ Project	AK	Ray	AZ	Mineral Hill	MT	Fort Knox	AK
		Carlotta	AZ	Montanore	MT	Twin Creeks	NV	Greens Creek	AK
		Tyrone Little Rock	NM	Trenton Canyon	NV			Kensington Project	AK
								Pogo Project	AK
								Morenci	AZ
								Hayden Hill	CA
								Jamestown	CA
								Beartrack	ID
								Grouse Creek	ID
								Stibnite	ID
								Stone Cabin	ID
								Thompson Creek	ID
								Basin Creek	MT
								Beal Mountain	MT
								Black Pine	MT
								East Boulder	MT
								Rock Creek	MT
								Troy	MT
								Zortman and Landusky	MT
								Dash	NV
								Jerritt Canyon	NV
								Gilt Edge	SD

5.10.3. COMBINATIONS OF GEOCHEMICAL AND HYDROLOGIC CHARACTERISTICS AND RELATIONSHIP TO POTENTIAL AND PREDICTED WATER QUALITY IMPACTS

Seventeen of the 71 NEPA mines reviewed identified moderate to high acid drainage potential and close proximity to surface water (perennial streams on site and/or direct discharges to surface water). Of these, 13 (77%) identified a moderate to high potential for surface water quality impacts. However, only two (12%) of these (Thompson Creek, ID and Zortman Landusky, MT) identified a high post-mitigation potential for surface water quality impacts (Table 5.24).

Table 5.24. Potential and Predicted Surface Water Quality Impacts for Mines with Moderate to High Acid Generation Potential and Close Proximity to Surface Water.

Name	State	Surface Water Impact Potential	Predicted Surface Water Quality Impacts
Greens Creek	AK	2	1
Carlotta	AZ	2	1
Hayden Hill	CA	2	1
Grouse Creek	ID	2	1
Stone Cabin	ID	1	1
Thompson Creek	ID	2	2
Beal Mountain	MT	2	1
Black Pine	MT	0	1
Montana Tunnels	MT	2	0
Montanore	MT	0	1
Zortman and Landusky	MT	3	3
Gold Quarry/Maggie Creek	NV	1	1
Goldstrike	NV	2	1
Jerritt Canyon	NV	2	1
Leeville	NV	2	1
Lone Tree	NV	2	1
Twin Creeks	NV	3	1

0 = no information; 1 = low; 2 = moderate; 3 = high.

Twenty of the 71 NEPA mines identified moderate to high acid drainage potential and close proximity to groundwater resources (0 – 50 ft depth to groundwater, springs on site, or discharges to groundwater). Of these, 15 (75%) identified a moderate to high potential for groundwater quality impacts. However, only three (15%) of these (Thompson Creek, ID; Golden Sunlight and Zortman and Landusky, MT) identified a high post-mitigation potential for groundwater quality impacts as shown in Table 5.25.

Similar results were found for the combination of contaminant leaching potential and proximity to water resources. Of the 17 mines with moderate to high contaminant leaching potential and close proximity to surface water resources, nine identified a moderate to high potential (pre-mitigation) for surface water quality impacts, but only two predicted moderate (Bear Track, ID) or high (Zortman and Landusky, MT) impacts to surface water after mitigation were in place, as shown in Table 5.26. Table 5.27 shows that 21 mines identified a moderate to high contaminant leaching potential and close proximity to groundwater resources. Of these 21 mines, 15 identified a moderate to high potential for groundwater quality impacts based on inherent characteristics. However, only four mines predicted that there would be moderate to high groundwater quality impacts after mitigation were in place.

Table 5.25. Potential and Predicted Groundwater Quality Impacts for Mines with Moderate to High Acid Drainage Potential and Close Proximity to Groundwater Resources

Name	State	Groundwater Impact Potential	Predicted Groundwater Impact
Greens Creek	AK	Low	Low
Hayden Hill	CA	Low	Low
Grouse Creek	ID	Low	Low
Stone Cabin	ID	No Info	Low
Thompson Creek	ID	Low	Moderate
Beal Mountain	MT	Low	Low
Black Pine	MT	Moderate	Low
Diamond Hill	MT	Low	Low
Golden Sunlight	MT	High	High
Montana Tunnels	MT	No Info	No Info
Zortman and Landusky	MT	Moderate	High
Battle Mountain Complex	NV	High	Low
Gold Quarry/ Maggie Creek	NV	High	Low
Goldstrike	NV	Moderate	Low
Jerritt Canyon	NV	Moderate	Low
Leeville	NV	High	Low
Lone Tree	NV	High	Low
Robinson (Ruth)	NV	Low	Low
Rochester	NV	Moderate	Low
Twin Creeks	NV	High	Low

These results suggest that even though a high proportion of the mines link a higher acid drainage or contaminant potential and close proximity to water with potential adverse impacts to water quality, the vast majority declare in EISs that mitigation measures will prevent these potential water quality impacts. Predictions of water quality not only do not assume "worst-case" conditions, they consistently assume "best-case" conditions, with all mitigation measures working effectively. Generally, post-mitigation predictions are more qualitative than pre-mitigation predictions (e.g., liners will not leak). As noted in Section 5, for mines with multiple EISs, the score represents the highest acid drainage potential, contaminant leaching potential and highest potential and predicted water quality. If individual EISs were examined, even fewer mines declared that inherent geochemical and hydrologic characteristics could adversely impact water quality.

Table 5.26. Potential and Predicted Surface Water Quality Impacts for Mines with Moderate to High Contaminant Leaching Potential and Close Proximity to Surface Water Resources

Name	State	Surface Water Impact Potential	Predicted Surface Water Impact Potential
Kensington Project	AK	Low	Low
Pogo Project	AK	Low	Moderate
Carlotta	AZ	Moderate	Low
Beartrack	ID	No Info	Moderate
Black Pine	MT	No Info	Low
Mineral Hill	MT	Low	Low
Montanore	MT	No Info	Low
Rock Creek	MT	Moderate	Low
Troy	MT	Low	Low
Zortman and Landusky	MT	High	High
Gold Quarry/ Maggie Creek	NV	Low	Low
Goldstrike	NV	Moderate	Low
Jerritt Canyon	NV	Moderate	Low
Leeville	NV	Moderate	Low
Lone Tree	NV	Moderate	Low
Twin Creeks	NV	High	Low
Gilt Edge	SD	Moderate	Low

5.10.4. CONCLUSIONS

The identification of geology and mineralization, as currently conducted in EISs, is generally a blunt tool for predicting water quality impacts. Geologic and mineralogic information is usually focused on the ore body rather than on all mined materials that could potentially impact water resources. Relatively weak relationships existed between geology and mineralization or ore association. Similarly, a relatively weak relationship existed between geology and mineralization and the potential for water quality impacts. The discrepancy or lack of good agreement between identified mineralization and acid drainage potential highlights the importance of coordinating mineralogic and acid drainage potential evaluations in the NEPA process. As noted in the companion report (Maest et al., 2005), the same geochemical test units should be used for testing of all parameters used to predict water quality impacts. In addition, more extensive information on mineralogy and mineralization should be included in EISs.

The EISs reviewed in detail spanned a period from 1978 to 2004. The availability of geochemical characterization data affects the ability to determine the potential for mines to release contaminants to water resources. Starting in 1980, regulatory agencies began to require or collect basic information on geochemical characterization, such as static and short-term leach testing. After 1990, many of the mines were conducting combinations of kinetic testing and static or short-term leach testing. EISs performed after about 1990 should have more reliable information on water quality impact potential than those with EISs completed before this time.

Table 5.27. Potential and Predicted Groundwater Quality Impacts for Mines with Moderate to High Contaminant Leaching Potential and Close Proximity to Groundwater Resources

Name	State	Groundwater Impact Potential	Predicted Groundwater Impact Potential
Kensington Project	AK	1	1
Pogo Project	AK	3	3
McLaughlin	CA	3	3
Beartrack	ID	0	1
Black Pine	MT	0	1
Golden Sunlight	MT	3	3
Rock Creek	MT	2	1
Stillwater	MT	1	1
Troy	MT	2	1
Zortman and Landusky	MT	2	3
Battle Mountain Complex	NV	2	1
Florida Canyon	NV	3	1
Gold Quarry/ Maggie Creek	NV	1	1
Goldstrike	NV	2	1
Jerritt Canyon	NV	2	1
Leeville	NV	2	1
Lone Tree	NV	1	1
Rochester	NV	2	1
Twin Creeks	NV	2	1
Gilt Edge	SD	2	1
Flambeau	WI	2	1

0 = no information; 1 = low; 2 = moderate; 3 = high.

6. WATER QUALITY PREDICTIONS AND IMPACTS AT NEPA MINES

This section contains a comparison of NEPA document identified potentials, mitigation, and predictions with actual water quality information contained either in subsequent NEPA documents or in other verifiable sources for selected mines.

Each case study includes a brief description of the information contained in the NEPA documents for each mine, along with information on water quality impacts either included in the NEPA documents, or contained in other documents as referenced. A summary of information on the water quality impacts and their causes is then provided for each mine. Additional information including the actual information from the NEPA document or other sources of information is contained in Appendix B Case Study Detailed Information (available at www/kuipersassoc.com or http://www.mineralpolicy.org/publications_welcome.cfm)

6.1. METHODS AND APPROACH

Two levels of study were undertaken for this project. The first level consisted of reviewing all available EISs for information relevant to water quality predictions in Section 5. The second level of study contained in this section, consisted of selecting a more limited number of mines for an in-depth study of predicted and actual water quality. The primary goal of the in-depth studies is to gain insights into the methods and approaches used to predict water quality and to determine whether these tools were successful.

The availability of water quality information after mining began was the primary factor in selecting a mine for in-depth study. For example, a number of operating or recently closed open-pit mines in Nevada and other states have no or very limited information on pit water quality because the mines have not stopped dewatering operations. These mines may have water quality information on groundwater or leachates, but no information is currently available that can be used to compare water quality predicted in the EIS to actual water quality. In addition to the availability of water quality information, the selected mines are also intended to represent a cross-section of commodities, mining types and climates.

In making the final selection of mines for in-depth study, the following priorities were identified:

- mines with long histories and NEPA documentation from new project to reclamation and closure;
- mines with different proximities to water resources but indicating water quality impacts
- mines that conducted some geochemical testing, and if possible, some water quality modeling;
- mines with different potentials to generate acid and leach contaminants to water resources

The list of mines that actually meet these criteria, particularly with respect to adequate reliable evaluations that have addressed water quality predictions and impacts, and are publicly available, is limited. NEPA histories at mines where subsequent EISs have been performed sometimes perform an evaluation of, current conditions and pre-mining predictions. These cases provide the most readily accessible, although not singular, opportunities for insight into the accuracy of water quality predictions as based on the information contained in NEPA documents.

A preliminary evaluation of the availability of operational water quality information was performed before selection of the case study mines. Operational and post-operational water quality information was available from EISs conducted after the new project EIS, especially for the states of Alaska, Montana, and Idaho, where multiple EISs were often available. In other states, such as Arizona, California, Nevada and Wisconsin, technical reports and water quality data were available from state agencies that regulate mining activities.

In addition to NEPA documents, which also include post-mining Engineering Evaluation/Cost Analysis (EE/CA), documents containing additional water quality information from some mines (e.g., Beal Mountain, MT; Grouse Creek, ID), water quality data were obtained for mines in Arizona, Nevada, California, and Wisconsin where situations with multiple EISs did not exist or those EISs did not address water quality impacts. The data for mines

was obtained from files at the state regulatory agencies or from reports written by agency personnel or mining company consultants. In many cases the information obtained is useful for pointing out what information was not contained in original NEPA documents relevant to eventual water quality impacts. The authors recognize that additional insights might have been gained by analyzing additional water quality data for the various mine sites, however the focus was on obtaining data that was verifiable and/or otherwise contained in prepared reports as a matter of efficiency.

The information gathered is presented in the form of case studies, which consist of three sections: summary of water quality predictions from NEPA documents; actual water quality data from NEPA documents, state water quality databases and other sources; and a comparison of predicted and actual water quality.

6.2. GENERAL AND ENVIRONMENTAL CHARACTERISTICS OF CASE STUDY MINES

In all, 25 different mines with complete NEPA documents and additional information obtained are presented and examined in detail with respect to water quality predictions and impacts in this section. Table 6.1 shows the complete list of 25 mines selected for case studies.

Table 6.1 Case Study Mines

Name	State
Greens Creek	AK
Bagdad	AZ
Ray	AZ
American Girl	CA
Castle Mountain	CA
Jamestown	CA
McLaughlin	CA
Mesquite	CA
Royal Mountain King	CA
Grouse Creek	ID
Thompson Creek	ID
Beal Mountain	MT
Black Pine	MT
Golden Sunlight	MT
Mineral Hill	MT
Stillwater	MT
Zortman and Landusky	MT
Florida Canyon	NV
Jerritt Canyon	NV
Lone Tree	NV
Rochester	NV
Round Mountain	NV
Ruby Hill	NV
Twin Creeks	NV
Flambeau	WI

6.2.1. GENERAL CHARACTERISTICS OF CASE STUDY MINES

Table 6.2 shows the 25 mines selected for in-depth study and the variability in their locations, commodities, mine operation types, climatic characteristics and proximity to water resources.

Table 6.2 Mines Selected for In-Depth Study: General Mine Site Characteristics

Mine	State	Commodity	Mine Type	Climate	Proximity to Groundwater	Proximity to Surface Water
Greens Creek	AK	Au, Ag, Pb, Zn	UG, FG	Marine West Coast	0-50 ft. or springs	Perennial streams on site
Bagdad	AZ	Cu, Mo	OP, FG, DL-SX	Dry/Arid	0-50 ft. or springs	Perennial streams >1 mi. away
Ray	AZ	Ag, Cu	OP, FG, DL-SX	Dry/Arid	>200 ft.	Perennial streams on site
American Girl	CA	Au, Ag	OP, HL, VL	Dry/Arid	0-50 ft. or springs	Perennial streams >1 mi. away
Castle Mountain	CA	Au, Ag	OP, HL, VL	Dry/Arid	>200 ft.	Perennial streams >1 mi. away
Jamestown	CA	Au	OP, VL	Humid Tropical	0-50 ft. or springs	Perennial streams on site
McLaughlin	CA	Au	OP, VL	Humid Tropical	0-50 ft. or springs	Perennial streams >1 mi. away
Mesquite	CA	Au, Ag	OP, HL, VL	Dry/Arid	<200 ft. but >50 ft	Perennial streams >1 mi. away
Royal Mountain King	CA	Au, Ag	OP, FG, VL	Humid Tropical	No info	No info
Grouse Creek	ID	Au, Ag	OP, HL, VL	Boreal Forest	0-50 ft. or springs	Perennial streams on site
Thompson Creek	ID	Mo	OP, FG	Boreal Forest	0-50 ft. or springs	Perennial streams on site
Beal Mountain	MT	Au, Ag	OP, HL	Boreal Forest	0-50 ft. or springs	Perennial streams on site
Black Pine	MT	Au, Ag, Cu	UG, FG	Boreal Forest	0-50 ft. or springs	Perennial streams on site
Golden Sunlight	MT	Au	UG, OP, VL	Boreal Forest	0-50 ft. or springs	Perennial streams <1 mi. away
Mineral Hill	MT	Au, Ag	UG, VL	Boreal Forest	<200 ft. but >50 ft	Perennial streams on site
Stillwater	MT	PGM	UG, FG, S	Boreal Forest	0-50 ft. or springs	Perennial streams <1 mi. away
Zortman and Landusky	MT	Au, Ag	OP, HL	Boreal Forest	0-50 ft. or springs	Perennial streams on site
Florida Canyon	NV	Au, Ag	OP, HL	Dry/Semi-Arid	0-50 ft. or springs	Perennial streams <1 mi. away
Jerritt Canyon	NV	Au, Ag	UG, OP, HL, VL	Dry/Semi-Arid	0-50 ft. or springs	Perennial streams on site
Lone Tree	NV	Au, Ag	OP, HL, VL	Dry/Semi-Arid	0-50 ft. or springs	Perennial streams >1 mi. away
Rochester	NV	Ag	OP, HL	Dry/Semi-Arid	0-50 ft. or springs	Perennial streams <1 mi. away
Round Mountain	NV	Au, Ag	OP, HL, VL	Dry/Semi-Arid	<200 ft. but >50 ft.	Perennial streams <1 mi. away
Ruby Hill	NV	Au, Ag	OP, HL	Dry/Semi-Arid	0-50 ft. or springs	Perennial streams <1 mi. away
Twin Creeks	NV	Au, Ag	OP, HL, VL	Dry/Semi-Arid	<200 ft. but >50 ft.	Perennial streams on site
Flambeau	WI	Pb, Zn	OP, F	Continental	0-50 ft. or springs	Perennial streams <1 mi. away

The mines studied in detail include one from Alaska, two from Arizona, six from California, two from Idaho, six from Montana, seven from Nevada, and one from Wisconsin. Eighteen mines were primarily gold and/or silver, two were primarily copper or copper molybdenum and one each were platinum group, primary molybdenum, and lead/zinc mines.

Four of the mines selected for study were underground mining operations, while 19 were open pit mining operations. Two were combined open pit and underground mining operations. Five of the mines used flotation (and in some cases gravity) processes exclusively for beneficiation (production of concentrates), two used both flotation and dump leach solvent extraction/electrowinning (SX/EW), and one used dump leach SX/EW processing exclusively. One used flotation with vat leaching processing; while 14 used either heap leaching, vat leaching, or a combination of both processes.

Five mines were located in dry/arid climates, seven in dry/semi-arid climates, eight in boreal forest climates, three in humid subtropical climates and one each in continental and marine west coast climates. Eighteen of the mines selected for study had a depth to groundwater of 0-50 feet or springs on site; four had groundwater depths of between 50 and 200 feet, two had a depth to groundwater of greater than 200 feet, and one had no information on the depth to groundwater. Eleven case study mines had perennial surface water streams on site, seven had perennial streams less than one mile away, six had perennial streams greater than one mile away, and one had no information on the proximity to surface water resources.

The major characteristics of the case study mines were similar to those of all mines with reviewed EISs, as shown in Table 6.3, considering that the availability of information on operational water quality was also a major factor in the selection of case-study mines. The highest percentage of case study mines was from Nevada, and this state had the highest percentage of mines for all major mines, NEPA-eligible mines, and mines with reviewed EISs. Somewhat higher percentages of mines from California and Montana were selected for case studies because of the ease of obtaining operational water quality information from these states.

Similar percentages of gold and/or silver mines were selected for case study as were present in all mines with reviewed EISs. However, a lower percentage of primary copper mines was selected for case study because of the difficulty in obtaining operational water quality information for these facilities. Case study mines and all mines with reviewed EISs had similar distributions of extraction and processing methods. In terms of operational status, no case study mines were in construction, in permitting, or withdrawn because operational water quality information would not be available for mines in these types of operational status.

Case study mines were also similar to all mines with reviewed EISs in terms of EIS elements related to water quality, as shown in Table 6.4. The elements listed in Table 6.3 are considered "inherent" factors that may affect water quality conditions. That is, these elements are related to conditions that are either related to climatic and hydrologic conditions at and near the mine site (in the case of climate, and proximity to water resources) or to qualities of the mined materials that may affect water quality (in the case of acid drainage and contaminant leaching potential). For a number of mines, little or no information on these elements was available in initial EISs, but subsequent NEPA documents either contained the first information or contained improved information after water quality conditions developed at the mine site during and after operation. Therefore, for acid drainage and contaminant leaching potential, the highest documented potential in any of the EISs was recorded.

Case study mines were similar to all mines with reviewed EISs in terms of climate and proximity to surface water resources. When compared to all mines with reviewed EISs, a higher percentage of case study mines had shallower depths to groundwater. However, six of the case study mines had groundwater depths greater than 50 feet below the ground surface. In terms of acid drainage potential, lower percentages of case study mines had low and high acid drainage potential, but higher percentages had moderate acid drainage potential. Therefore, the case study mines provide a somewhat more evenly distributed range of acid drainage potentials than all mines with reviewed EISs. Case study mines had nearly identical percentages of mines with low and high contaminant leaching potential, but

more case study mines had moderate acid drainage potential, reflecting fewer mines in the "no information" category for case study mines.

Table 6.3. Comparison of General Categories for All Mines with Reviewed EISs and Case Study Mines (% of mines in subcategory)

Category	Subcategory	All Mines with Reviewed EISs	Case Study Mines
Location	Alaska	10%	4%
	Arizona	11%	8%
	California	11%	24%
	Colorado	0%	0%
	Idaho	9%	8%
	Michigan	0%	0%
	Montana	18%	24%
	Nevada	32%	28%
	New Mexico	3%	0%
	South Carolina	0%	0%
	South Dakota	1%	0%
	Utah	1%	0%
	Washington	0%	0%
	Wisconsin	1%	4%
Commodity	Primary Gold	20%	12%
	Primary Silver	7%	4%
	Gold and Silver	55%	64%
	Copper	20%	4%
	Copper and Molybdenum	1%	4%
	Molybdenum	1%	4%
	Lead and Zinc	6%	4%
	Platinum Group	3%	4%
Extraction Methods	Underground	18%	16%
	Open Pit	72%	76%
	Underground + Open Pit	10%	8%
Processing Methods	Heap and/or Vat Leach	62%	72%
	Flotation and Gravity	27%	28%
	Dump Leach (SX/EW)	11%	8%
	Heap Leach	25%	20%
	Vat Leach	14%	16%
	Heap Leach and Vat Leach	23%	32%
	Smelter	1%	0%
Operational Status	Operating	49%	52%
	Closed	37%	48%
	In Construction	1%	0%
	Permitting	7%	0%
	Withdrawn	6%	0%
Total number of mines		71	25

Table 6.4. Comparison of EIS Elements for All Mines with Reviewed EISs and Case Study Mines (% of mines with sub-element)

Element	Sub-element	All Mines with Reviewed EISs	Case Study Mines
Climate	Dry/Arid	20%	20%
	Dry/Semi-Arid	35%	28%
	Humid Subtropical	4%	12%
	Marine West Coast	4%	4%
	Boreal Forest	28%	32%
	Continental	3%	4%
	Sub-Arctic	4%	0%
Surface Water Proximity	No information	7%	4%
	Perennial Streams >1 mile	26%	24%
	Perennial streams <1 mile	25%	28%
	Perennial streams on site	44%	44%
Groundwater Proximity	No information	12%	4%
	Groundwater >200 ft deep	16%	8%
	Groundwater 50-200 ft deep	13%	16%
	Groundwater 0-50 ft deep/springs on site	59%	72%
Acid Drainage Potential (highest)	No information	9%	8%
	Low	58%	48%
	Moderate	6%	32%
	High	27%	12%
Contaminant Leaching Potential (highest)	No information	22%	12%
	Low	32%	32%
	Moderate	30%	40%
	High	17%	16%
Total number of mines		71	25

Overall, the criteria of having variability in general categories such as geographic location, commodity type, extraction and processing methods and variability in EIS elements related to water quality were met for the selected case study mines. Considering the additional limitation of having readily accessible operational water quality information, the case study mines reflect well the distribution of general categories and water quality-related elements that are present in the larger subsets of hard rock mines in the United States.

6.2.2. ENVIRONMENTAL INFORMATION RELATED TO WATER QUALITY

Table 6.5 shows the mines selected for in-depth study and the variability in their environmental characteristics that may affect water quality. The NEPA information, which was also contained in Section 5, includes geology and mineralization, water quality potential, mitigation, and predicted water quality impacts.

Geology and Mineralization

In terms of geology and mineralization categorizations for the 25 case study mines selected, no or insufficient information was available in the NEPA documents for five mines. Two mines were categorized as having low sulfide content with carbonate present or hosted in carbonate. Eight mines were categorized as having sulfides present with carbonate or moderately high neutralizing-potential rock present and eight were categorized as having sulfides present with no carbonates or carbonates not mentioned or associated with the ore body. One mine was categorized as having high sulfide content with carbonates low or not present.

Table 6.5. Water Quality Characterizations for Case Study Mines.

NEPA EIS Water Quality Category		Greens Creek	Bagdad	Ray	American Girl	Castle Mountain	Jamestown	McLaughlin	Mesquite	Royal Mountain King	Grouse Creek	Thompson Creek	Beal Mountain	Black Pine
		AK	AZ	AZ	CA	CA	CA	CA	CA	CA	ID	ID	MT	MT
Geology and Mineralization		Sulfides present, carbonate or mod-high NP rock present	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body	No/insufficient information available	Gold ore in quartz/magnetite stringers or disseminated. No mention of carbonates	No mention of carbonates; no information on ore mineralogy	No/insufficient information available	No/insufficient information available	Ore in gneiss and granite. No mention of carbonates or sulfides	No/insufficient information available	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body	Sulfides present, carbonate or mod-high NP rock present	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body
Geochemical Characteri-zation and Modeling	Testing Methods	Static, short-term leach, and kinetic tests	Static testing only	No lab/field predictive testing conducted/type unknown	Static ABA and short-term leach tests (WET, SPLP)	Static ABA and short-term leach tests (SPLP)	Short-term leach testing only	Static and short-term leach tests	Static and kinetic tests, whole rock analysis	Static testing only	Static and short-term leach testing conducted	Static, short-term leach, and kinetic testing conducted	Static, short-term leach, and kinetic testing conducted	No information
	Constitutents of Concern	Zinc	Arsenic, fluoride, lead, metals, sulfate	Copper, beryllium, zinc, turbidity, pH	No information	Total dissolved solids	Tailings leachate: barium, arsenic, chromium	Copper	Arsenic, selenium, silver, bismuth, thallium	No information	Lead, arsenic, cyanide, ammonia, nitrate	Cadmium, copper, iron, lead, zinc, selenium, sulfate	Arsenic, cadmium, lead, nitrate, sulfate, cyanide, TDS	Sulfate, copper, zinc, iron, cadmium, low pH
	Predictive Models	Water quality and quantity	None	None	Water quantity	None	None	None	Water quantity and quality	None	Water quantity only	Water quality and quantity	None	None
Water Quality Impact Potential	Acid Drainage	Moderate	Low	No information	Low	Low	Low	Low	Low	Low	Moderate	Moderate	Moderate	High
	Contaminant Leaching	Low	No information	No information	Low	Low	Low	Moderate	Low	No information	Low	Low	Low	Moderate
	Groundwater	Moderate	Low	No information	Moderate	Low	Moderate	High	Moderate	Moderate	Moderate	Moderate	Moderate	No information
	Surface Water	Moderate	Low	No information available	Low	Low	Moderate	Moderate	Moderate	No information	Moderate	Moderate	Moderate	No information
	Pit Water	No pit lake expected to form	Low/similar to surrounding groundwater	No information	No pit lake expected to form	Low	Moderate	High	Moderate	No information	Moderate	Moderate	No information	No pit lake expected to form
Proposed Mitigations	Groundwater	Groundwater/ leachate capture; Liming, blending, segregation, etc. of PAG material	No information	No information	Source controls without treatment	Groundwater/ leachate capture	Groundwater/ leachate capture; Monitoring or characterization	Monitoring or characterization	Groundwater/ leachate capture; Monitoring or characterization	No information	Monitoring or characterization; Source controls without treatment; Liming, blending, segregation, etc. of PAG material	Monitoring or characterization; Groundwater/ leachate capture	Monitoring or characterization; source controls without treatment; Liming, blending, segregation, etc. of PAG material	Source controls without treatment
	Surface Water	Stormwater/ sediment/ erosion controls; Surface water leachate capture/treatment	Stormwater/ sediment/ erosion controls; Source controls without water capture	No information	Source controls without water capture	Monitoring or characterization; Stormwater/ sediment/ erosion controls; Source controls without water capture	Monitoring or characterization; Stormwater/ sediment/ erosion controls; Source controls without water capture; Surface water/leachate capture/ treatment	Stormwater/sediment /erosion controls; Source controls without water capture; Surface water/ leachate capture/ treatment	Monitoring or characterization; Stormwater/ sediment/ erosion controls; Source controls without water capture	Stormwater/ sediment/ erosion controls	Monitoring or characterization; stormwater/sediment /erosion controls; source controls without water capture	Monitoring or characterization; surface water/ leachate capture/ treatment	Stormwater/ sediment/ erosion controls; source controls without water capture	Monitoring or characterization; stormwater/ sediment/ erosion controls; source controls without water capture
	Pit Water	No pit lake will form	Pit lake prevention	No information	No pit lake will form	Pit lake monitoring; Pit lake prevention	No information	No information	No information	No information	Pit lake prevention	No information	Pit lake prevention	No pit lake will form
	Water Treatment	Treatment for metals and/or acid drainage	No information or none identified	No information or none identified	No information or none identified	No information or none identified	Water treatment for cyanide	No information or none identified	No information or none identified	No information or none identified	Treatment for cyanide, metals and/or acid drainage; treatment in perpetuity	No information or none identified	Water treatment for cyanide	No information or none identified
Predicted Water Quality Impacts	Groundwater	Low	Low	No information	Low	Low	Low	High	Low	No information	Low	Moderate	Low	Low
	Surface Water	Low	Low	No information	Low	Low	Low	Moderate	Low	No information	Low	Moderate	Low	Low
	Pit Water	No pit lake expected to form	No information	No information	No pit lake expected to form	Low	Moderate	High	Moderate	No information	Low/similar to surrounding groundwater	Low/similar to surrounding groundwater	Low/similar to surrounding groundwater	No pit lake expected to form
Discharges	Zero Discharge	No information	No information	No information	Yes	Yes	Yes	No information	No information	No information	Yes	No information	Yes	Yes
	Surface Discharge	Yes	Yes	Yes	No information	No information	No information	Yes	No information	No information	No information	Yes	No information	No information
	Groundwater Discharge	No information	No information	No information	No information	No information	No information	No information	No information	No information	No information	No information	No information	No information

459

Table 6.5. Water Quality Characterizations for Case Study Mines (continued)

NEPA EIS Water Quality Category		Golden Sunlight	Mineral Hill	Stillwater	Zortman and Landusky	Florida Canyon	Jerritt Canyon	Lone Tree	Rochester	Round Mountain	Ruby Hill	Twin Creeks	Flambeau
		MT	MT	MT	MT	NV	NV	NV	NV	NV	NV	NV	WI
Geology and Mineralization		High sulfide content, carbonates lowinot present	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body	Sulfides present, carbonate or mod-high NP rock present	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body	Sulfides present, carbonate or mod- high NP rock present	Low sulfide content, carbonate present or hosted in carbonate	Sulfides present, carbonate or mod- high NP rock present	Low sulfide content, carbonate present or hosted in carbonate	Sulfides present, carbonate or mod- high NP rock present	Sulfides present, carbonate or mod- high NP rock present	Sulfides present, carbonate or mod- high NP rock present	Sulfides present, no carbonates/ carbonates not mentioned or associated with ore body
Geochemical Characterization and Modeling	Testing Methods	Static, short-term leach, and kinetic tests	Short-term leach and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests	Static, short-term leach, and kinetic tests
	Constitutents of Concern	Aluminum, arsenic, cadmium, copper, zinc, pH, sulfate, calcium, magnesium, chromium, iron, lead, manganese, nickel, selenium, nitrate	Arsenic, cyanide, manganese, nitrate	Nitrate	Aluminum, cadmium, iron, copper, fluoride, zinc, cyanide, metallocyanide complexes, low pH, sulfate, nitrate, arsenic	Aluminum, antimony, arsenic, cadmium, iron, lead, mercury, thallium, TDS, cyanide	Arsenic, selenium, nitrate, sulfate	Arsenic, iron, cyanide, antimony, cadmium, nickel, fluoride, sulfate, TDS	Iron, aluminum, copper, lead, cadmium, zinc, pH	Aluminum, arsenic, fluoride, magnesium, nickel, zinc, antimony, selenium, iron, mercury, lead, manganese, nitrate, sulfate, TDS	Arsenic, aluminium, antimony, TDS, pH	TDS, pH, beryllium, cadmium, selenium, zinc, aluminum, antimony, arsenic, iron, manganese, mercury, nickel, thallium, sulfate	Iron, manganese, sulfate
	Predictive Models	Water quality and quantity	Water quantity only	Water quality and quantity	Water quantity only	Water quantity only	None	Water quality and quantity	None	Water quality and quantity	Water quality and quantity	Water quality and quantity	Water quality only
Water Quality Impact Potential	Acid Drainage	High	Low	Low	High	Low	Moderate	Moderate	Moderate	Low	Low	Moderate	No information
	Contaminant Leaching	High	Moderate	Moderate	Moderate	High	Moderate	High	Moderate	High	Moderate	High	Moderate
	Groundwater	High	Moderate	Low	Moderate	High	Moderate	Low	Moderate	High	Low	Moderate	Moderate
	Surface Water	Low	Low	Low	High	No information	Moderate	Moderate	Moderate	Moderate	Low	High	Moderate
	Pit Water	High	No pit lake expected to form	No pit lake expected to form	No information	No information	No pit lake expected to form	High	No pit lake expected to form	Moderate	No pit lake expected to form	High	High
Proposed Mitigations	Groundwater	Monitoring or characterization; Source controls without treatment; Ground-water/ leachate capture with treatment; In-perpetuity capture and/or treatment; Long-term fund	Groundwater/ leachate capture with treatment	Monitoring or characterization; Source controls without treatment; Groundwater/ leachate capture with treatment	Monitoring or characterization; Source controls without treatment; Groundwater/ leachate capture with treatment; Liming, blending, segregation, etc. of PAG material	Source controls without treatment; Liming, blending, segregation, etc. of PAG material	Source controls without treatment; Liming, blending, segregation, etc. of PAG material	Monitoring or characterization; Groundwater/ leachate capture with treatment	No information	Source controls without treatment	Source controls without treatment	Monitoring or characterization; Source controls without treatment; Liming, blending, segregation, etc. of PAG material	Source controls without treatment; groundwater/ leachate capture with treatment
	Surface Water	Surface water/ leachate capture/ treatment; Surface water augmentation/ replacement	No information	Monitoring or characterization; Stormwater/ sediment/ erosion controls; Source controls without water capture	Monitoring or characterization; Stormwater/ sediment/ero-sion controls; Source controls without water capture; Surface water/ leachate capture/ treat-ment; In-perpetuity cap-ture/ treatment	Source controls without water capture	Stormwater/ sediment/ erosion controls; Source controls without water capture; Surface water/ leachate capture/ treatment	Stormwater/ sediment/ erosion controls; Source controls without water capture	Stormwater/ sediment/ erosion controls	Stormwater/ sediment/ erosion controls	Stormwater/ sediment/ erosion controls	Monitoring or characterization; Stormwater/ sediment/ erosion controls	Source controls without water capture; Surface water/ leachate capture/ treatment
	Pit Water	Treatment of pit water or backfill amendment	No pit lake will form	No pit lake will form	Pit lake prevention	Pit lake prevention	Pit lake prevention	Pit lake prevention	No pit lake will form	Pit lake monitoring	No pit lake will form	Pit lake monitoring	Pit lake prevention
	Water Treatment	Water treatment in perpetuity	Water treatment using non-conventional approaches	Water treatment using non-conventional approaches	Treatment for cyanide, metals and/or acid drainage; Non-conventional approaches; Treatment in perpetuity	No information available or no water treatment measures identified	No information available or no water treatment measures identified	Treatment for cyanide, metals and/or acid drainage; Treatment using non-conventional approaches	No information available or no water treatment measures identified	No information available or no water treatment measures identified	No information available or no water treatment measures identified	Water treatment for metals and/or acid drainage	Water treatment for metals and/or acid drainage
Predicted Water Quality Impacts	Groundwater	High	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	Low
	Surface Water	Low	Low	Low	High	Low	Low	Low	Low	Low	Low	Low	Low
	Pit Water	High	No pit lake expected to form	No pit lake expected to form	High	No pit lake expected to form	No pit lake expected to form	High	No pit lake expected to form	Moderate	No pit lake expected to form	High	High
Discharges	Zero Discharge	No information	No information	No information	No information	Yes	No information	No information	No information	Yes	Yes	No information	No information
	Surface Discharge	No information	Yes	Yes	Yes	No information	No information	Yes	No information	No information	No information	Yes	Yes
	Groundwater Discharge	No information	No information	Yes	No information	No information	No information	No information	No information	No information	No information	Yes	No information

Geochemical Characterization and Modeling

In terms of geochemical characterization and modeling categorizations for the 25 case study mines selected, no or insufficient information was available in the NEPA documents for two mines. Static testing only was performed at two mines and short-term leach testing only at one mine. Static and short-term leach testing were performed at three mines. Static and kinetic testing was conducted at one mine and short-term leach and kinetic testing conducted at one mine also. Static, short-term leach and kinetic testing were conducted at 14 mines.

No information was available on constituents of concern in the NEPA documents for two of the case study mines. The other mines identified a variety of constituents that can be categorized as metals (19 mines), metalloids (14 mines), sulfate (10 mines), nitrogen compounds (eight mines), cyanide (six mines) and other conventional pollutants (11 mines).

No predictive models were used according to the NEPA documents for nine of the 25 case study mines. Only water quantity predictive models were used at four mines while only water quality predictive models were used at one mine. Both water quantity and water quality predictive models were used as a part of the NEPA process at ten mines.

Water Quality Impact Potential

No information on acid drainage potential was contained in the NEPA documents for two of the case study mines. Low acid drainage potential was identified at eleven mines, moderate acid drainage potential at eight mines and high acid drainage potential at three mines.

No information on contaminant leachate potential was contained in the NEPA documents for three of the case study mines. Low contaminant leaching potential (leachate does not exceed water quality standards) was identified at six mines. Moderate potential for elevated contaminant concentrations (leachate exceeds water quality standards by 1-10 times) was identified at 11 mines. High potential for elevated contaminant concentrations (leachate exceeds water quality standards by over 10 times) was identified at four mines.

Groundwater impact information was not available in the NEPA documents for three of the case study mines. Low groundwater quality impacts (< relevant standards) were identified at four of the mines. Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) were identified at 12 of the mines. High groundwater quality impacts (>10 times relevant standards) were identified at five of the mines,

Surface water impact information was not available in the NEPA documents for five of the case study mines. Low surface water quality impacts (< relevant standards) were identified at six of the mines. Moderate surface water quality impacts (≥ and up to 10 times relevant standards) were identified at 11 of the mines. High surface water quality impacts (>10 times relevant standards) were identified at two of the mines.

Pit water impact information was not available in the NEPA documents for five of the case study mines. Low pit water quality impacts (water quality similar to surrounding groundwater or < relevant standards) was identified at one mine. Moderate pit water quality impacts (≥ and up to 10 times relevant standards) were identified at four mines. High pit water quality impacts (>10 times water quality standards) were identified at six mines. No pit lake was expected to form (pit above water table or no pit) at eight mines.

Proposed Mitigation

Groundwater mitigation information was not available or no mitigation were identified in the NEPA documents for four of the case study mines. Groundwater monitoring or characterization of mined materials was identified as a mitigation at 11 mines. Source controls without treatment (liners, leak detection systems, run on/off controls, caps/covers, adit plugging) was identified as a mitigation at 13 mines. Groundwater/leachate capture with treatment was identified as a mitigation at nine mines. Perpetual groundwater capture and/or treatment and/or a long-term

mitigation fund were identified as mitigation measures at one mine. Liming, blending, segregation, etc. of potentially acid-generating (PAG) material was identified as mitigation at seven mines.

Surface water mitigation information was not available or no mitigation were identified in the NEPA documents for two of the case study mines. Surface water monitoring was identified as a mitigation measure at seven mines. Stormwater, sediment or erosion controls were identified as mitigation measures at eighteen mines. Source controls not involving capture of water (including liners, adit plugging, caps/covers, leak detection systems, spill prevention measures, and liming/blending/segregating of PAG materials) were identified as mitigation at twelve mines. Surface water/leachate capture and/or treatment (including settling, land application, routing of water, seepage collection) was identified as a mitigation at 10 mines. Perpetual surface water capture and/or treatment were identified mitigation measures at one mine.

Pit water mitigation information was not available or no mitigation were identified in the NEPA documents for five of the case study mines. Pit lake monitoring was identified as a mitigation measure at two mines. Pit lake prevention (backfill, pumping, stormwater diversion, use in mine operation) was identified as a mitigation at nine mines. Treatment of pit water or backfill amendment (e.g., lime addition) was identified as a mitigation at one mine. No pit lake was expected to form (underground mine or pit above water table) at seven mines.

Water treatment information was not available or water treatment was not identified in the NEPA documents for twelve of the case study mines. Water treatment for cyanide was identified as a mitigation approach at five mines. Water treatment for metals and/or acid drainage was identified as a mitigation measure at seven mines. Water treatment using non-conventional approaches was identified as a mitigation method at four mines. Perpetual water treatment to meet discharge standards was identified as a mitigation at three mines.

Predicted Water Quality Impacts

Predicted groundwater quality impact information was not available in the NEPA documents for two of the case study mines. Low groundwater quality impacts (< relevant standards) were predicted at 17 of the mines. Moderate groundwater quality impacts (≥ and up to 10 times relevant standards) were predicted at one mine. High groundwater quality impacts (>10 times relevant standards) were predicted at four mines.

Predicted surface water quality impact information was not available in the NEPA documents for two of the case study mines. Low surface water quality impacts (< relevant standards) were predicted at 18 of the mines. Moderate surface water quality impacts (≥ and up to 10 times relevant standards) were predicted at three of the mines. High surface water quality impacts (>10 times standards) were predicted at one mine.

Pit water quality impact information was not available in the NEPA documents for four of the case study mines. Low pit water quality impacts (concentrations less than relevant standards), or water quality similar to surrounding groundwater were predicted at four mines. Moderate pit water quality impacts (≥ and up to 10 times relevant standards) were predicted at two mines. High pit water quality impacts (>10 time relevant standards) were predicted at six mines. No pit lake (underground mine or pit bottom above water table) was expected to form in eight of the mines.

Discharges

Two case study mines had groundwater discharges, suggesting that 20 of the mines were not expected to have groundwater discharges. Thirteen case study mines had surface water discharges with various forms of NPDES permits, while 12 were not expected to have surface water discharges. Seven mines were identified as "zero discharge" facilities.

6.3. PREDICTED AND ACTUAL WATER QUALITY AT THE CASE STUDY MINES

Summaries for the 25 case study mines are contained in Section 6.3. Ownership, commodities, extraction and processing types, years of operation, acres disturbed, and financial assurance amounts are summarized for each case study mine. Information related to water quality predictions and conditions is summarized in three sections: water quality predictions summary, which contains information from the NEPA documents reviewed; actual water quality conditions; and comparison of predicted and actual water quality conditions. More detailed information on the case study mines is contained in Appendix B Case Study Detailed Information, especially on environmental quality information from the NEPA documents and actual water quality conditions.

6.3.1. GREENS CREEK, ALASKA

The Greens Creek mine, owned by Kennecott Minerals Corporation (70%) and Hecla (30%), has been in operation since 1984. The primary commodities mined are gold, silver, lead and zinc from underground mining and flotation and gravity processing operations. It disturbs 170 acres on Tongass National Forest lands in Forest Service Region 10 (actually within a National Monument). It has a current financial assurance amount of $26.2 million.

6.3.1.1. WATER QUALITY PREDICTIONS SUMMARY

The Tongass National Forest was the lead agency for all NEPA actions at the Greens Creek Mine. NEPA was required for the new project to be permitted, and an EIS was completed in 1983. NEPA was not required by the EPA for the NPDES discharge permit. Subsequent EAs for general operation and waste rock expansion were conducted in 1988 and 1992, respectively. In 2003, an EIS was conducted for tailings disposal. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1983 EIS

The 1983 EIS contains no specific mention of any specific geochemistry field or lab tests performed, however the EIS did identify the potential for the project to degrade surface and/or groundwater as a result of acid drainage. Increased concentrations of total dissolved solids and sulfate were predicted for groundwater in general (no specific mention was made about the basis of this prediction or the actual increased concentrations), but surface water concentrations were predicted to meet regulatory standards due to high dilution (greater than 68:1). Excess tailings liquids and other mine-related discharges were to be released from sediment basins and ponds without further treatment to the marine environment.

1988 EA

The 1988 EA specifically cited the results of "preliminary" lab tests, including sulfur determinations, biological tests and column leach tests performed in 1982 and 1985, as an indication that the tailings would not produce acid drainage. Only one tailings sample was analyzed for acid drainage potential.

1992 EA

The 1992 EA described geochemical tests, including metals analysis, acid-base accounting, synthetic precipitation leach tests and leachate modeling. The results indicated that some waste rock had the potential to be acid-producing, but a greater portion was shown to be acid-neutralizing; Overall, no net acid drainage production was expected from waste rock. Zinc concentrations in waste rock leachate (using existing waste rock material) were predicted to be high (0.5 – 1.3 mg/l), based on the synthetic precipitation leach tests, while other metals concentrations were predicted to be low.

2003 EIS

The 2003 EIS did not address waste rock issues. The 2003 EIS included a hydrology and geochemistry evaluation of the tailings facility in the Appendix. The evaluation included both static and long-term testing. According to the text, static test results indicated that the tailings were potentially acid generating (all static test results indicated an AGP:ANP ratio of greater than 1.0). However, based on humidity cell tests it was concluded that the tailings would not produce acid drainage, although the evaluation acknowledged some inconsistencies in the results. Predictions based largely on oxidation rates projected lag times for acid drainage generation of 10 to 33 years. According to the EIS, reclamation and closure methods would slow or stop the weathering process (e.g., oxidation rates) so that acidification would not occur.

The prediction of no significant acid drainage in the evaluation relied upon the use of a mass loading model (Excel© spreadsheet with Palisade@Risk©) to simulate water quality downgradient from the tailings facility. Modeling results predicted the tailings would remain alkaline for at least 500 years while acknowledging that the prediction of rates of oxidation and acidification are complex and acidic conditions could exist in the tailings. The primary mitigation employed was an engineered soil cover to reduce acidification risk by through reduction of oxygen infiltration.

6.3.1.2. ACTUAL WATER QUALITY CONDITIONS

According to the 1992 EA, actual runoff from the waste rock piles was reported to have an average zinc concentration of 1.65 mg/l.

The hydrology and geochemistry evaluation in the 2003 EIS contained some site water chemistry information that can be used to verify the previous and existing water quality predictions. Tailings facility water had relatively neutral pH values (7.8 to 8.0), increased sulfate concentrations (1,800 to 2,000 mg/l) and low metals concentrations (0.01 mg/l zinc) in the tailings saturated zone. However, underdrain water quality showed some moderate acidity (pH 6.5 to 6.7), generally lower sulfate concentrations (800 to 2,000 mg/l) and higher zinc concentrations (1-2 mg/l) and in the tailings unsaturated zone, new tailings showed lowered pH (5.8 to 6.6) and increased sulfate (2,300 to 2,400 mg/l) with higher zinc concentrations (0.1 – 3.6 mg/l) and additionally significantly increased copper, lead and selenium. Old unsaturated tailings showed a neutral pH (7.5) but high concentrations of sulfate (17,000 mg/l) along with increased concentrations of metals (zinc and magnesium).

According to the 2003 EIS, groundwater quality monitoring wells monitored from 1988 to 2000 have not indicated increasing metal and sulfate levels or acidity so far, although anomalously high sulfate concentrations are noted. Surface water quality monitoring similarly indicates no impacts to surface water quality although some evidence of increased cadmium, copper, mercury and zinc greater than Alaska Water Quality Standards were noted in the late 1980's and 1990. However, the EIS contradicts itself by acknowledging that lower pH, higher sulfate and increased zinc concentrations are evident in some smaller streams. The EIS speculated that the increased concentrations were due to sulfide material (tailings or waste rock) lying outside the tailings pile capture area. The potential for long-term acid drainage from the tailings was mentioned in the 2003 EIS, but impacts occurred in less than 20 years rather than in greater than 500 years.

No reports or notices of violations related to water quality were noted.

6.3.1.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.6 provides a summary and comparison of potential, predicted and actual water quality information for the Greens Creek mine. The accuracy of the predictions is discussed in this section.

Table 6.6. Greens Creek, AK, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings	• 1983 EIS: Increased concentrations of sulfate and TDS in groundwater but no impact to surface water and marine waters due to mitigation • 1988 EA: Testing indicates no potential for acid drainage • 2003 EIS: Tailings have long-term potential for acid drainage	• 1983 EIS: Surface water and marine water dilution adequate to meet standards • 2003 EIS: acid drainage to be mitigated by short-term capture of tailings solution and long-term by reclamation and closure • grade and cap tailings	• 1983 EIS: No impacts to surface water or marine water predicted • 2003 EIS: No impacts from acid drainage for at least 500 years	• 2003 EIS: Old unsaturated tailings leachate, new tailings leachate, and underdrain water quality all show evidence of acidity and increased sulfate and zinc and in some cases copper, lead, magnesium and selenium • 2003 EIS: Surface water quality monitoring indicates some evidence of lower pH and increased cadmium, copper, mercury, sulfate and zinc due to high sulfide material (tailings or waste rock) lying outside the tailings pile capture area
	Waste Rock	• 1992 EA: Some waste rock has the potential to be acid drainage producing but a greater portion is acid drainage neutralizing, with a prediction of no net acid drainage generation from waste rock. • 1992 EA: Zinc concentrations for waste rock leachate predicted to be high (0.5 – 1.3 mg/l) and other metals concentrations low.	• 1983 EIS: Surface water and marine water dilution adequate to meet standards. • 1992 EA: Mixing of waste rock to neutralize acid drainage potential 2003 EIS: Backfilling of waste rock into underground mine	• 1983 EIS: No impacts to surface water or marine water predicted • 1992 EA: No impacts to surface water or marine water predicted	• 1992 EA: Actual runoff from the waste rock piles was reported to have an average zinc concentration of 1.65 mg/l. • 2003 EIS: lower pH, higher sulfate, and increased zinc concentrations are evident in some smaller streams possibly due to high sulfide material (tailings or waste rock) lying outside the tailings pile capture area

Tailings Seepage and Waste Rock Runoff: The observed acidic and metal-rich drainage seeping from the tailings impoundment and the observed high zinc concentrations in waste rock runoff were not predicted in the 1988 EA. In this EA, geochemical testing indicated no potential for acid drainage. The 2003 EIS predicted long-term potential for acid drainage in tailings (10 to 33 years, based on ABA tests), but the post- mitigation (following installation of reclamation covers) prediction, using modeling, indicated that this would not occur for at least 500 years. The long-term potential for acid drainage from tailings occurred in less than 20 years. Therefore, the observed acidic, metal-rich seepage from tailings entering smaller streams mentioned in the 2003 EIS was not accurately predicted in the 1988 EA. The 1992 EA estimated, based most likely on existing leachate concentrations, that zinc concentrations in the expanded waste rock leachate material would be high (0.5 – 1.3 mg/l) but that net drainage from the waste rock would not be acidic. No subsequent information on waste rock leachate concentrations has been obtained to determine if values from the expanded facility are within the predicted range.

Surface water quality impacts: The observed lower pH and increased metal and sulfate concentrations in surface water were not predicted by the EISs. The 1983 EIS predicted that dilution would prevent impacts to surface water. Therefore, the observed surface water quality impacts were not accurately predicted.

6.3.2. BAGDAD, ARIZONA

The Bagdad mine, wholly owned by Phelps Dodge Corporation, is an historic mine that has been in operation since before 1960. The primary commodities mined are copper and molybdenum from open pit mining and flotation and dump leach processing operations. It disturbs approximately 4,424 acres on private land and BLM lands. It has a current financial assurance amount of $12.7 million.

6.3.2.1. WATER QUALITY PREDICTIONS SUMMARY

The BLM has been the lead agency for all NEPA actions at the Bagdad mine. NEPA was not required for the historic mining project to be permitted and was not required by the EPA for the NPDES discharge permit. An EIS was completed in 1996 for only impacts related to the expansion of the mill tailings and waste rock storage areas. The following sections summarize the water quality predictions made in the NEPA document reviewed as well as information on actual water quality.

1996 EIS

The 1996 EIS included information on total sulfur, pyritic sulfur and NP/AP (ABA) testing. Increased (greater than background) concentrations of arsenic, fluoride and lead were noted along with elevated levels of other metals and sulfate. No predictive modeling was performed. According to the EIS, potential adverse groundwater impacts from tailings water would be minimal, and impacts to surface water were predicted to be low, due to construction design of the tailings facilities. The low potential for acid mine drainage was illustrated by the overall quality of the pit water, which had relatively low concentrations of metals and sulfate in a highly mineralized area. The overall quality of the water was described as good with only a few measurements of metals and fluoride that exceeded Aquifer Water Quality Standards. Exceedences were also found in groundwater samples from non-disturbed areas of the mine, suggesting that elevated background concentrations of arsenic, fluoride and lead exist in the groundwater in the Bagdad region.

According to the EIS, mitigation would consist of the majority of the tailings water evaporating off the surface of the facility. Toe channels and underdrains around the South waste rock dump would be used to prevent the percolation of surface water through the facility to minimize infiltration into the aquifer. Surface runoff would be promoted by using grading and a cap. Stormwater diversions would be implemented. Horizontal dewatering wells were proposed to limit water entering the pit and lower the potential for sulfide ore oxidation. The proposed South waste rock disposal facility was not expected to adversely impact groundwater quality, and no impacts to water quality of Francis Creek, Burro Creek, or Big Sandy River were predicted.

6.3.2.2. ACTUAL WATER QUALITY CONDITIONS

Surface water quality monitoring data from the Arizona Department of Environmental Quality (ADEQ) for 1991 to 2004 was obtained and reviewed. In addition, information from an EPA report on damage cases (U.S. EPA, 1997) provided information on releases from the Cyprus Bagdad Mine. The records show that prior to and following the 1996 EIS, water quality impacts had been noted at the site including the following:

- In May-June of 1991, a tailings impoundment failed and discharged to Copper Creek. Elevated concentrations of mercury, phenols, ammonia, copper and acidity occurred in Boulder and Copper creeks, resulting in a fish kill. Boulder Creek was diverted around the spill, and the contamination was reportedly cleaned up.

- In 1991 and 1992 samples were taken from various surface water resources (Boulder Creek, Wilder-Burro Creek, Copper Creek), which showed periodic exceedences of water quality standards for arsenic, beryllium copper, lead, mercury, pH and turbidity. Contaminant sources were not identified.
- From 1998-2002, samples were taken from similar surface water resources (Boulder Creek, Burro Creek, Butte Creek) with periodic exceedences of water quality standards for arsenic, copper, lead, mercury, selenium and turbidity. Contaminant sources were not identified, but exceedences occurred at Phelps Dodge monitoring points.
- In May 1991, seepage of pregnant leach solution from the Copper Creek Leaching System was discovered in a receiving pool in Boulder Creek Studies indicated that instead of being contained by the Copper Creek Flood Basin, the heavily contaminated solution seeped under the dam The concentration of total copper in samples collected in the pool in Boulder Creek was as high as 76.4 mg/l. Out of 18 samples collected from the pool during the month that the seepage was discovered, every sample exceeded background copper levels by more than 0.5 mg/l, the state's Agricultural Livestock Watering Standard for total recoverable copper. No information was available in the files reviewed that clearly documented the source of the infiltration; however, several documents referred to "repairs" to various HDPE liners. It was not clear from information in the files precisely which units were lined, when they were lined, or the capacity or dimensions of the units.
- On March 29, 1993, U.S. EPA issued a Finding of Violation and Order against Cyprus. On September 13, 1996, the U.S. Department of Justice brought civil action against Cyprus for discharging contaminated water in violation of the Clean Water Act and Arizona law. The civil action cited discharges from tailings ponds, pipelines, leach dumps, other facilities and a sewage treatment plant. The largest discharges cited, however, came from the mine's Copper Creek Leaching Basin. In a Consent Decree, Cyprus agreed to pay a civil penalty totaling $760,000.
- Of 143 samples of water collected from January 1992 until October 1993, all of which were collected from sumps installed in the alluvial gravels of Boulder Creek downgradient from the facility, not one sample showed any elevation above background concentrations of copper. The cutoff wall was credited with reducing total copper concentrations in shallow ground water 400 feet downgradient of the wall from 7.2 mg/l before the wall was constructed to 0.8 mg/l afterwards. ADEQ personnel concluded in an internal 1995 memorandum that the overall effectiveness of the remedial measures undertaken by Cyprus was amply demonstrated by the consistently low concentrations of copper measured in sumps downgradient of the wall and the consistently within-standard copper values achieved in the receiving pool. As of November 1996, the available water quality enforcement files did not contain any more information regarding how Cyprus is managing it's PLS pond and other structures.

6.3.2.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.7 provides a summary and comparison of potential, predicted and actual water quality information for the Bagdad mine. The accuracy of the predictions is discussed in this section.

The 1996 EIS identified the potential for acid drainage and other impacts, and suggested that existing water quality did not demonstrate impacts because background water quality had exceedences. The EIS specifically predicted that there would be no impacts to the water quality of Francis Creek, Burro Creek or Big Sand River. However, exceedences of water quality standards were observed in Burro Creek between Francis Creek and Boulder Creek after the 1996 EIS. Therefore, assuming that the source of the exceedences is the mine, the observed water quality was not accurately predicted in the EIS.

Table 6.7. Bagdad, AZ. Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Surface Water	Tailings	1996 EIS: • Potential for acid drainage and other impacts indicated in testing. • Existing water quality does not indicate impacts. • Background water quality indicates natural exceedences.	1996 EIS: • Facility design to prevent groundwater and surface water impacts. o Stormwater diversions o Grade and cap surface o Leachate collection	1996 EIS: • No impacts to water quality of Francis Creek, Burro Creek or Big Sandy River are predicted.	WQ Monitoring (1998-2002): • Boulder Creek: exceedences for arsenic, lead, mercury, and selenium • Burro Creek: exceedences for copper and mercury Butte Creek: exceedences for mercury and selenium

6.3.3. RAY MINE,ARIZONA

The Ray mine owned by ASARCO has been in operation since 1948. It is projected to continue operations until 2044. The primary commodities mined are copper and silver from open pit mining and flotation and gravity and dump leach processing operations. It disturbs 6,231 acres on private land. It has a financial assurance amount of $784,826.

6.3.3.1. WATER QUALITY PREDICTIONS SUMMARY

The BLM has been the lead agency for all NEPA actions at the Ray mine. NEPA was not required for the historic mining project to be permitted and was not required by the EPA for the NPDES discharge permit. An EIS was completed in 1999 only for the impacts related to a proposed land exchange that would enable the mining company to eliminate public lands from within and adjacent to areas of ongoing mine development. The following sections summarize the water quality predictions made in the NEPA document reviewed. Information on actual water quality is discussed in the following section.

1999 EIS

The EIS was completed for a land exchange. No geochemical tests or models were mentioned in the EIS, and as a result, no information on acid drainage potential or contaminant leaching potential was provided. The mine is a porphyry copper deposit.

According to the EIS, the foreseeable mining uses on the selected lands will likely affect groundwater. Similarly, the foreseeable mining uses on the selected lands would result in impacts to surface water sources and features. Impacts to surface water sources and features are not currently known. However, the EIS stated that it is not possible to describe specific details concerning groundwater or surface or water quality impacts because a detailed mine plan has not been developed and because specific designs and measures that may minimize impacts to surface water and groundwater sources and features are not currently known .

6.3.3.2. ACTUAL WATER QUALITY CONDITIONS

Groundwater monitoring data from 1990 to 1994 were obtained from the Arizona Department of Environmental Quality (ADEQ), and information on violations and water quality exceedences from 1990 through 1996 were obtained from U.S. EPA (1997: Damage Cases). Information from both sources indicates the following:

- Due to a spill or spills in 1990, TDS, ammonia, arsenic and copper concentrations exceeded standards along a 14 to 50 mile stretch of the Gila River. Exceedences of up to eight times the standard were noted.
- Tributary headwater streams (Mineral Creek) showed exceedences of arsenic, beryllium, copper and turbidity during the period 1990-1994, and elevated concentrations of copper and zinc in sediment were also noted.
- An ADEQ complaint investigation conducted from 1991-1994 in Mineral Creek from the headwaters to the Gila River, revealed that at multiple sites sampled around the Ray Mine and Gibson Mine, uses were impaired by arsenic, beryllium, copper, low pH, and zinc.
- An EPA copper mine study in 1992 showed that two sites in Mineral Creek had uses impaired by copper and low pH.
- From August 1990 through November 1993, at least 19 spills of hazardous materials were reported at the ASARCO Ray Mine. The majority of spills were from dams, pipelines and ponds. The discharges typically resulted from either accidental releases associated with heavy rain or from chronic seepage from leach facilities to groundwater, which then entered the creek. As a result, surface water quality has been significantly affected. A total of 41 violations of total copper, dissolved copper, and beryllium numeric surface water quality standards was documented by the Arizona Department of Environmental Quality (ADEQ), EPA, and ASARCO in Mineral Creek below the Ray Mine.
- On March 30, 1995, ASARCO noted a low pH reading in Mineral Creek. Upon investigation, ASARCO discovered that a 30-inch gravity flow transit pipeline was leaking. The next day, an HPDE line to the Ray concentrator came apart at the flanged end and released approximately 150,000 gallons of fresh water.
- Unauthorized discharges of Ray Unit process waters to Mineral Creek and Elder Gulch have occurred many times in recent years, including numerous violations of permit effluent limits. During one eight-month period from January to August 1993, nine spills occurred at the mine that resulted in unauthorized discharges to Mineral Creek. The specific causes included overflows, equipment failures and damage caused by heavy machinery. Ambient water quality sampling data have documented non-compliance with water quality standards in Mineral Creek for a variety of metals. Copper concentrations as high as 2.7 mg/l were reported in creek waters below the mine. In 1993, copper concentrations in the creek above 1 mg/l were recorded in May, June, July, August and September. Water quality violations were documented in the same stretch of the creek for beryllium. In March 1993, discharges from a tributary of Mineral Creek that also drains the Ray Unit, Elder Gulch, exceeded standards for hexavalent chromium, sulfide, and total arsenic.
- In December 1992 and January 1993, heavy rains caused the Gila River to breach the AB-BC tailings impoundment containment dike 13 times in January 1993, eroding through the dike and into the toe of the tailings pile. The total discharge was approximately 292,000 tons (216,000 cu yd) of tailings. Sampling of the river showed that elevated concentrations of pollutants occurred at least 11 miles downstream of the spill. The tailings formed bank and bottom deposits in the river, impairing both recreational uses and the quality of habitat for plants and animals. The discharge also had an adverse effect on the sediment loading of the river and stream morphology.

In July 1996, the Arizona Department of Environmental Quality (ADEQ) reported that approximately one-half mile of the Mineral Creek stream bed below the Ray Mine was visibly affected by mining activities. The cobble and gravel substrate was coated with a blue-green layer of copper oxides. According to ADEQ, visible environmental damage to Mineral Creek constitutes a violation of narrative surface water quality standards. quality standards for beryllium, cadmium and copper were also violated in Mineral Creek in April 1996. ADEQ termed the violations a dramatic degradation of water quality by mining activities. In addition, groundwater standards for arsenic, cadmium, pH and beryllium were exceeded in three wells. In April 1995, EPA reported that six groundwater wells downgradient of the electrowinning plant and the electrowinning dam were continuously pumping pregnant leach solution. EPA concluded that it is likely that contaminants are escaping from the Ray Unit and entering Mineral Creek via groundwater.

6.3.3.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.8 provides a summary and comparison of potential, predicted and actual water quality information for the Ray mine. The accuracy of the predictions is discussed in this section.

The 1999 EIS did not provide any information on potential impacts to water quality, with the only mitigation being that all affected water would be captured in the open pit. It did not address the numerous and serious past or existing surface water, groundwater and stream habitat impacts from mine operations. Prior to the 1999 EIS, Ray mine operations did result in degradation of surface water in Mineral Creek and the Gila River with ammonia, arsenic, beryllium, copper, low pH, total dissolved solids, turbidity and zinc.

Table 6.8. Ray, AZ, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings	1999 EIS: • No information provided	1999 EIS: • All affected water to flow towards the open pit capture zone	1999 EIS: • Impacts to groundwater and surface water predicted, but details cannot be described because a detailed mine plan has not been developed.	WQ Monitoring: • Prior to the 1999 EIS significant impacts to surface water and groundwater were identified as a result of tailings spills, leaking pregnant leach solution and other sources

6.3.4. AMERICAN GIRL, CALIFORNIA

The American Girl Mine is owned by MK Gold Company (50%) and Hecla Mining Company (50%). Operations were started in 1995, and the mine closed in 1996. Gold and silver were produced from both underground and open pit operations and were processed using vat leach (for gold) and cyanide heap leach (for silver) methods. It disturbs 155 acres of BLM land in Imperial County and has a current financial assurance amount of $278,750.

6.3.4.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA and CEQA were required for the project to be permitted. An older EA was completed in 1988, and EIS/EIR was completed in 1994. No subsequent NEPA or state equivalent environmental assessments were performed for the project. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1988 EA

Annual precipitation is 3 to 4 inches per year, and evaporation in nearby cities is 100 to 119 inches annually. All the surface drainages in the area are ephemeral, with flows occurring only during and following major precipitation events. Groundwater in the vicinity of the proposed heap leach pad occurs from 80-240 feet bgs.

Gold ore is in quartz/magnetite stringers in metasedimentary and igneous rock. No field or laboratory tests were performed. A water quantity model was performed to predict the amount of drawdown in the groundwater table. No information was provided on acid drainage potential, contaminant leaching potential, or constituents of concern.

A background groundwater quality evaluation showed that TDS, chloride and fluoride concentrations exceeded drinking water standards. Two potential groundwater impacts were identified: drawdown of groundwater in the

alluvial deposits due to withdrawal for operations, which could influence surrounding groundwater users, and groundwater quality influences resulting from the heap leach operations. The proposed mine was determined to have no identifiable impact on surface water resources, because surface waters flows only during major precipitation events.

The heap leach pad was proposed to be lined. Ore processing (mill and heap leach) operations were planned to be operated as zero discharge facilities. Inflow of groundwater to mine pits/underground areas was expected to be consumed in zero-discharge project operations (dust control, process water, etc.), which would avoid seepage of contaminated water into groundwater. Diversion ditches above the mining areas were proposed to channel water around active mining and waste rock disposal areas. Sediment traps would be installed, if required, during construction.

No impact to groundwater was predicted with proper installation and operation of the lined pad facility. Even if leachate from the pad bypasses the liner, groundwater impacts were predicted to be minimal, as the leachate would reach the saturated zone after a long travel time, allowing the leachate to be naturally attenuated. The American Girl Canyon Project was predicted to have no identifiable impact on groundwater quality, and other alternatives were expected to have no impact as well. The proposed alternative was also predicted to have no identifiable impact on surface water resources, as surface waters flow only during major precipitation events. In the underground test adit, the first inflows were encountered at an elevation of about 510 above msl, just above the base of the proposed open pits. Therefore, the pit is not expected to contain permanent water after mining.

No information was provided on discharges to groundwater or surface water.

1994 EIS

The mine area is arid, has low amounts of precipitation, arid winds, high temperatures, and a high percentage of sunshine in a desert environment. Average on-site precipitation is 2.14 inches, and at Yuma station, annual evaporation is 97.66. No evaporation data were collected on site. All surface drainages in the area are ephemeral. Flash flooding and sediment-laden flow are common and result in shifting of drainage channel positions. Groundwater in the vicinity of the proposed project occurs in the alluvium of Tumco and American Girl Washes, and in the unconsolidated deposits underlying Pilot Knob Mesa. The depth to groundwater was variable. The bedrock groundwater table was generally 100 ft deep in the American Girl Wash. Exploration holes drilled to depths of 500-600 ft bgs have significantly lower water levels. Groundwater in the vicinity of the existing leach pad and open-pit occurs at a depth ranging from 35-240 ft bgs. The Padre Madre Wash had drill holes completed to depths of at least 200 ft below the base of the canyon floor, and they were dry. The Tumco Wash exploration holes were dry to the 500 ft elevation with some seeps and inflows below this elevation. Water has been encountered in exploration holes at depths of 700 ft Depths to groundwater in the Pilot Knob Mesa range from 200-400 ft.

Mineralization has a strong quartz-magnetite association and is characterized by irregular stringer zones containing the two minerals. High grade zones may occur as semi-massive lenses up to several feet thick. Gold occurs within the magnetite-quartz stringers or is disseminated in the surrounding wall rock. Geochemical testing of waste materials from the Padre Madre and American Girl Canyon mine operations have shown little potential to generate acid or leach metals or other constituents at concentrations of concern for waste characterization or water quality. Waste Extraction Test (WET) results for the Oro Cruz tailings would be classed as a Class C (inert) waste. The Oro Cruz tailings and spent ore would not be acid generating (total sulfur less than 0.01%). EPA Method 1312 (SPLP) tests showed that the Oro Cruz tailings would not leach metals or other constituents of concern to surface water or groundwater. Due to the degree of oxidation of the ore and waste rock, acid generation would not be significant.

The Proposed Oro Cruz operations may impact groundwater by accidental leakage of solutions from the American Girl Canyon heap leach facility. A potential impact of mine waste material and exposed mineralized areas would be the leaching of constituents from these materials into surface water. The depths of open-pit mining in the proposed

Cross and Queen pits would generally be above the levels of groundwater encountered in Oro Cruz exploration holes. Groundwater inflows into the mine pits would be non-existent or limited to minor seeps.

For mitigation, processing facilities would continue to be regulated as a zero discharge site by the RWQCB requirements.

Oro Cruz tailings and spent ore were not predicted to leach metals or other constituents of concern for contamination of groundwater. The impact to groundwater quality from the leach pad was not predicted to be significant. Surface water quality data are unavailable due to the ephemeral nature of the streams. The impact of Oro Cruz operations on surface water quality was not predicted to be significant. The depths of open-pit mining in the proposed Cross and Queen pits would generally be above the levels of groundwater encountered in Oro Cruz exploration holes. Groundwater inflows into the mine pits were expected to be non-existent or limited to minor seeps.

No information was provided on discharges to groundwater or surface water.

6.3.4.2. ACTUAL WATER QUALITY CONDITIONS

The information on actual water quality conditions was based on a phone call with staff from the Regional Water Quality Control Board (RWQCB) in Palm Desert, California in September 2004. The American Girl Mine has completed mining operations, and the RWQCB rescinded their permit in 2004. The groundwater wells were abandoned and completely reclaimed after five years of post-closure monitoring (every six months). No water quality problems were encountered, but after shut down, one sampling had elevated copper concentrations in the groundwater. The RWQCB required monitoring for an additional five years, and no problems were encountered during this period. Groundwater monitoring was required for TDS, pH, copper, total cyanide, sulfate, arsenic, gold, silver, mercury, iron, nitrate and selenium.

6.3.4.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.9 provides a summary and comparison of potential, predicted and actual water quality information for the American Girl Mine. The accuracy of the predictions is discussed in this section.

To date, no groundwater, surface water or pit water quality impacts were observed.

Table 6.9. American Girl, CA, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings and Spent Ore	• Accidental leakage of solutions from the American Girl Canyon heap leach facility to groundwater	• Zero-discharge processing facilities	• No leaching of contaminants from spent ore to groundwater. Impact to groundwater from leach pad not significant	• None
Surface Water	Mine waste/ ore/exposed mineralized areas	•Leaching of constituents from mine waste/ exposed mineralized areas to surface water	• Zero-discharge processing facilities	• Impact to surface water quality not significant	• None
Pit Water	Open pit walls	• Groundwater inflows into the mine pits would be non-existent or limited to minor seeps.	• Zero-discharge processing facilities	• Groundwater table below bottom of pits	• None

6.3.5. CASTLE MOUNTAIN, CALIFORNIA

The Castle Mountain Mine, also known as the Viceroy Mine, is located in San Bernardino County and is owned by Viceroy Gold Corporation (75%) and MK Gold Company (25%). The mine operated from 1992 to 2001. Gold and silver ore are extracted from an open pit, and heap and vat leach processing were used. The mine is located on 3,645 acres of BLM land in the Needles District and 265 acres of private land; the number of disturbed acres is unknown. The bond amount is $1,605,000.

6.3.5.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA and CEQA were required for the new project to be permitted. A new project EIS/EIR was completed in 1990 (document not obtained after numerous attempts), and an expansion EIS was completed in 1997. The expansion included increasing the area of open pit, creating an overburden storage site and expanding the heap leach pad. There are no NPDES permits for the mine. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1998 EIS/EIR

The mine is in an arid desert setting. Precipitation in the New York Mountains in the northwest boundary of the valley exceeds 10 inches, while the valley floor receives ~8 inches. Streams within the basin are ephemeral, with the exception of Piute Spring, which flows perennially and is several miles from the mine site. Depth to groundwater is shallowest in the western recharge portion of the basin and becomes deeper toward the east. The general groundwater flow direction is toward the east-southeast. Depths in monitoring wells in the vicinity of the project area in 1990 ranged from ~360 - 750 feet.

Volcanic, metamorphic and igneous (granitic) rocks are in the project area. Recent alluvium has filled Lanfair Valley with 550-1000 ft of clay-rich Pleistocene age lacustrine deposits that are interbedded with Pleistocene lava flows. Static (ABA) and short-term leach tests (EPA Method 1312 - EP Toxicity test) were performed. Both the raw ore and leached ore show little to no potential to generate acid. Existing data indicate little potential for acid-producing conditions. Total sulfur was below detection in the overburden. In raw and leached ore, the NP/AP was 2.7 and 8.0 respectively. Soluble metals in the ore and overburden are non detectable for most metals. None of the results exceed California Soluble Threshold Limit Concentrations.

Due to low metal concentrations, the extremely dry site environment, and the net neutralizing potential of the ore and waste rock, the geochemistry of materials that would be mined was not expected to pose a threat to surface or groundwater quality. Because of the low soluble metals concentrations and the high NP:AP ratio of ore and overburden that would remain in the mine pit walls, it is expected that the quality of any water that could collect in the mine pits would be good. This water would be suitable for wildlife use.

The heap leach pads were planned to be lined, and sealed drainage/collection facilities would transport and contain the leaching solution. Leach pads dikes were proposed for confining and controlling drainage from the leach piles. At project completion, heap leach piles will be neutralized and rinsed and solution will be removed from storage facilities. Leakage detection/ monitoring system will be employed for the leach pads, emergency solution storage and storm water storage basins. If a pit lake forms, it will be monitored monthly for conformation to state and federal water quality standards. Should any pit lake constituent exceed a federal or state MCL, the pit will be backfilled above the high water level. Storage basins will be constructed with adequate freeboard to preclude entry of storm water into the system. No water quality impacts were expected after mitigation are in place.

No information was provided on discharges to groundwater or surface water.

6.3.5.2. ACTUAL WATER QUALITY CONDITIONS

Based on a phone call with staff of the Palm Desert Regional Water Quality Control Board in September 2004, the Castle Mountain, or Viceroy, Mine is in the process of closure and is still monitoring groundwater for TDS, total and free cyanide and arsenic. Groundwater at the site is approximately 600 ft deep, and there is no surface water near the mine. The Regional Board tests for heap leach impacts to groundwater from the pads and the ponds, with an emphasis on cyanide.

6.3.5.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.10 provides a summary and comparison of potential, predicted and actual water quality information for the Castle Mountain Mine.

Mitigation were used even though the potential for water quality impacts was low. There were no impacts to date.

Table 6.10. Castle Mountain, CA, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and surface water	Heap leach facility	• No threat to surface water or groundwater quality due to dry site environment and low potential to generate acid and metals	• Lined heap leach pad, leachate collection systems, leach pad dikes; rinsing and neutralization upon closure	• Same as potential	• None to date
Pit Water	Open Pit	• Good pit water quality due to low potential for acid generation and metals leaching; suitable for wildlife use.	• Monitoring; backfilling if standards exceeded	• Same as potential	• None to date

6.3.6. JAMESTOWN, CALIFORNIA

The Jamestown mine, owned by Sonora Mining Corporation, began operation in 1987 and closed in 1994. The primary commodity mined was gold from open pit mining and flotation processing, with vat leach processing operations conducted off-site. The mine is located on private lands. There is no current financial assurance for the mine.

6.3.6.1. WATER QUALITY SUMMARY

The County of Tuolumne has been the lead agency under the California Environmental Quality Act (CEQA) for the new project to be permitted, and an EIS/EIR was completed in 1983. Supplemental EIS/EIRs were conducted in 1986 and 1989 (not obtained), and an EIS/EIR was conducted in 1991 for mine expansion. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1983 EIS/EIR

According to the 1983 EIS/EIR, the Mother Lode ore zone is a quartz-rich and separated by a slate (phyllite) and serpentenite assemblages. A short-term leach test (WET or CAMWET test) was the only field or laboratory test mentioned in the EIS/EIR. Barium, arsenic and chromium were noted in the tailings leachate. Acid drainage potential was not specifically addressed. According to the EIS/EIR, the most important potential groundwater impact is the

long-term migration of leachate generated from the tailings site. Dissolved constituents derived from the stockpiles may pass through the sedimentation ponds and eventually discharge to surface water. Accidental damage to the tailings pipeline could release chemical constituents (e.g., barium, arsenic, chromium) to surface water. Surface mine pits will be allowed to fill with water. The precise water quality of these ponds was not determined for the EIS/EIR but would presumably be of poorer quality than the pre-mining groundwater due to the effects of oxidation and evaporation.

According to the EIS/EIR, mitigation consisted of the tailings embankment being designed as a zero discharge system, but the potential for tailings water to seep from the pond into surface water was acknowledged. Surface water or groundwater quality impacts were not expected after mitigation are in place. The only impact that could not be mitigated would be lowered groundwater levels in the drawdown area near the pit.

1991 EIS/EIR

The proposed expansion included utilization of cyanide for leaching on site (not previously proposed or used). Short-term leach testing (CAMWET test) was performed on flotation tailings, thiourea tailings and representative rock and soil samples. Results indicated that the mine tailings will not contain contaminants that need to be controlled, and the overburden material was non-hazardous, non-toxic, and non-acid generating. According to the EIS/EIR, overall groundwater quality may be impacted to some degree by the quality of water in the abandoned pits. The impoundment water may contain concentrations of total dissolved solids higher than is currently present in the bedrock groundwater systems. Overburden storage areas could potentially impact the quality of surface waters, and the solution could potentially seep from the tailings facility into surface water.

According to the EIS/EIR, mitigation consisted of the zero discharge tailings embankment, the use of cyanide destruction processes, dilution of cyanide tailings with flotation tailings and monitoring. Erosion control structures for the tailings management facility were also mentioned. Potential impacts to groundwater and surface water were expected to be insignificant.

1985 Report of Waste Discharge

A 1985 Report of Waste Discharge (RWD) was obtained from the RWQCB. According to the report, hydrothermal solutions have mineralized ultrabasic intrusive rocks, sediments and volcanics, but the percentages of sulfides were low.

Waste Extraction Tests were performed on four samples: Composite head sample = ore from diamond drill core; Sample C = tailings and process water produced by thiourea leaching of the flotation concentrate; Sample D = tailings and process water produced by cyanide leaching; and Test #20 Tail = tailings from froth flotation testing without residue from treatment of the concentrate. A Potential Acidity with Peroxide test, described in EPA 670/274-070, pg 48-49, was also performed. Neutralization potential was tested using the procedure by Grube (pg 50-51 of the Report of Waste Discharge).

Each of the four samples was divided into two samples (A and B). For the composite head sample (ore), there were no exceedences of standards in the extract. For sample C (thiourea tailings), there were exceedences of arsenic (18 and 19 µg/l). Sample D (cyanide tailings) had exceedences of arsenic (15, 16 µg/l) and TDS (551, 550 mg/l). Sample Test #20 (froth flotation tailings) had one exceedence of arsenic (15µg/l). Generally all concentrations were low.

Acid base accounting tests were performed. The NP/AP ratios were 6.8 for the ore tailings, 2.8 for the thiourea tailings, and 3.1 for the cyanide tailings. The froth tailings generated no acid. Additional ore and waste rock samples (one ore and 5 waste rock) all had NP/AP values of between 3.5:1 and 47:1.

The Jamestown Mine (Harvard and Crystalline pits) was proposed to be operated as a closed system, with the exception of some seasonal surface runoff from the east side of the property that will be closely monitored.

6.3.6.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring data from 1988 to 2003 were obtained from the RWQCB and reviewed. No information was obtained on the number of surface water and groundwater monitoring locations, and no information was available on baseline water quality conditions or water quality violations.

The records show the following information on operational water quality:

- Exceedences of sulfate, nitrate and arsenic drinking water standards occurred in some groundwater monitoring wells. Downgradient of the waste rock and tailings management facilities, sulfate, nitrate, TDS and arsenic concentrations increased over time. Sulfate concentrations steadily increased (up to ~2,000 mg/l) since ~ 1990; nitrate concentrations increased (up to ~600 mg/l) from ~1990 to ~1997 and then decreased); total dissolved solids concentrations were as high as ~3,200 mg/l and are continuing to increase; and arsenic concentrations (up to 20 µg/l), may have peaked in the mid-1990s. For example, sulfate concentrations downgradient of the waste rock dump increased from 50 mg/l in January 1990 to 2,600 mg/l in May 2003, and increased in groundwater downgradient of the tailings facility from 63 mg/l in January 1988 to 2,000 mg/l in October 2003. TDS concentrations in a tailings area monitoring well increased from 310 mg/l in February 1988 to 3,200 mg/l in October 2003.
- Sulfate and nitrate concentrations exceeded drinking water standards in the Harvard Pit. Sulfate concentrations were continually increasing (up to ~1,200 mg/l), arsenic concentrations may have peaked in late 1990's (max. conc. = 1,600 µg/l l), and pH values decreased from ~8.5 (1987) to ~6.8 (2000). Sulfate concentrations were 10 mg/l in April 1988 (and then less than 200 mg/l for the remainder of 1988) and increased steadily to 1,200 mg/l in May 1999 and May 2003. Arsenic concentrations were ~10 µg/l in 1988 but increased to 1,600 µg/l in July 1991 and, with two exceptions, were >400 µg/l since 1995.

Before closure, Sonora Mining Company sold much of the land at the mine to Tuolumne County, and the county indemnified the mine, at the same time canceling a $3 million insurance policy for mine remediation. Since then, the RWQCB has sued the county for water quality violations related to the tailings impoundment and waste rock piles. The pit water at the site is considered groundwater, but there has been no official ruling yet on whether it is groundwater or surface water. The water level in the pit will be rising for the next 40 to 50 years. There were no notices of violation for pit water quality (RWQCB, October 2004 conversation).

6.3.6.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.11 provides a summary and comparison of potential, predicted and actual water quality information for the Jamestown mine. The accuracy of the predictions is discussed in this section.

Observed Groundwater Quality Impacts from Tailings and Waste Rock: The 1983 EIS/EIR indicated the potential for migration of tailings leachate to groundwater. However, no impacts to groundwater quality were predicted after mitigation were in place. The RWD noted that acid drainage potential was low but that there was potential for generation of contaminated leachate from the tailings. However, this information was not noted in the EIR/EIS.

The 1991 EIS/EIR also indicated no potential for acid drainage or other contaminants, although it does indicate that tailings and waste rock seepage with high TDS could impact groundwater and/or surface water. Laboratory test results indicated that the mine tailings will not contain contaminants that need to be controlled, and that the overburden material was non-hazardous, non-toxic and non-acid generating. Arsenic and TDS drinking water standards were slightly exceeded in the short-term leach tests performed on the tailings, but actual concentrations of arsenic, TDS, sulfate, and nitrate were substantially higher in groundwater.

Table 6.11. Jamestown, CA. Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings	• 1983 EIS/EIR: Migration of tailings leachate to groundwater and surface water 1991 EIS/EIR: No potential for acid drainage or other contaminant leaching. Seepage with high TDS could impact groundwater and/or surface water. Exceedences of As and TDS drinking water standards in short-term leach tests; NP:AP ratios 2.8 and 3.1.	• 1983 EIS/EIR and 1991 EIS/EIR: Facility design to prevent groundwater and surface water impacts. • Embankment design (zero discharge) • Compact tailings subsurface (no liner) • Grade and cap surfaces	• 1983 EIS/EIR: No impacts to surface water or groundwater quality after mitigation are in place • 1991 EIS/EIR: Potential impacts to groundwater and surface water are expected to be insignificant	WQ Monitoring: Groundwater affected by tailings and waste rock. Sulfate, nitrate, TDS and arsenic concentrations have increased significantly and exceed drinking water standards
	Waste Rock	• 1983 EIS/EIR: Migration of leachate to groundwater and surface water. Water quality from stockpiles would be of similar or lower quality than the pre-mining groundwater 1991 EIS/EIR: No potential for acid drainage or other contaminants. NP:AP ratios 3.5 to 47; no short-term leach testing on waste rock. Waste rock could affect surface water quality	• 1983 EIS/EIR: No mitigation identified • 1990 EIS/EIR: No mitigation identified		
Pit Water	Open Pit	• 1983 EIS/EIR: Similar or lower quality than premising groundwater due to oxidation and evaporation. Potential impacts to groundwater from water in pits. • 1991 EIS/EIR: Groundwater quality may be impacted by water in the abandoned pits	• 1983 EIS/EIR: No mitigation identified • 1990 EIS/EIR: No mitigation identified	• 1983 EIS/EIR: No impacts to surface water or groundwater quality after mitigation are in place • 1991 EIS/EIR: Potential impacts to groundwater and surface water are expected to be insignificant. No estimates of pit water quality.	Pit water sulfate concentrations have been continually increasing (up to ~1,200 mg/l), arsenic concentrations may have peaked in late 1990's (max. conc. = 1,600 μg/l), pH decreased from ~8.5 (1987) to ~6.8 (2000).

The EIS predicted that impacts to groundwater and surface water after mitigation are in place are expected to be insignificant. Therefore, the potential (pre-mitigation) water quality was a better measure of actual water quality than the predicted (post-mitigation) water quality impacts. Additionally, the 1991 EIS/EIR did not note the exceedences of sulfate, nitrate, TDS and arsenic in groundwater that were already evident in groundwater monitoring data by 1990. The test results were inaccurate, because contaminants have leaked from the tailings impoundment and the waste rock and impacted groundwater.

Observed Pit Water Quality Impacts: The 1983 EIS/EIR did indicate that pit lake water quality would be poorer than pre-mining groundwater quality. However, no details on the types of impacts (chemically) were presented. Therefore, predictions of pit water quality were correct generally, but neither the contaminants of concern nor the concentrations were estimated in the EIRs.

6.3.7. MCLAUGHLIN, CALIFORNIA

The McLaughlin Mine was owned by Homestake Mining Company and operated from 1985-2002. The primary commodity mined was gold from open pit mining and pressure oxidation of sulfide/refractory ore followed by vat leach cyanide processing operations. It disturbs 803 acres in the Ukiah District on BLM land. It has a current financial assurance amount of $12.2 million.

6.3.7.1. WATER QUALITY PREDICTIONS SUMMARY

The counties of Yolo, Napa and Sonoma were the lead agency under the CEQA for the new project to be permitted, and an EIS/EIR was completed in 1983. NEPA/CEQA was not required for the NPDES discharge permit. No subsequent NEPA or state equivalent environmental assessments were performed for the project. The following sections summarize the water quality predictions made in the NEPA document reviewed as well as information on actual water quality.

1983 EIS/EIR

Static and short term leach testing, paste pH, and an unidentified water quality model were presented as characterization and modeling approaches in the EIS/EIR. Copper, manganese and TDS were identified as the constituents of concern. They identified the potential for permanent degradation of groundwater quality; however, surface water quality impacts were predicted to be minimized with the implementation of mitigation measures. The pit water was predicted to be of poor quality.

According to the EIS/EIR, geochemical testing consisted of static (similar to NAG – using hydrogen peroxide), short-term leach (deionized water extraction test; California Waste Extraction Procedure), and paste pH tests. Modeling (type of model not specified) of impacts to surface water (Hunting Creek) quality was conducted. Constituents of concern identified included copper, manganese and total dissolved solids.

Ninety-two percent of the waste rock was determined to be either neutral or neutralizing. Comparison of the (tailings) extract analysis concentrations (from the WET test) with the health-based Soluble Threshold Limit Concentrations (STLCs) showed that the concentrations of copper exceeded the STLC; therefore, the tailings were considered hazardous. In addition to high copper values, the tailings extract also had lead, arsenic, silver and cyanide concentrations in excess of water quality standards.

According to the EIS, permanent degradation of groundwater quality was expected, due to tailings seepage. Potential impacts from waste rock to surface water included: (1) increased sedimentation from runoff, (2) increased total dissolved solids from leachate, and (3) increased heavy metal concentrations from acidic leachate. Water accumulated in the pit was expected to be of poor quality, with high concentrations of heavy metals and major ions including arsenic, cadmium, iron, lead, manganese, mercury, nickel, boron, sodium, chloride and sulfate.

Mitigation identified in the EIS included groundwater monitoring and underdrains for waste rock piles. Erosion/sedimentation controls would be used to protect surface water from waste rock impacts. Lime will be added to sediment ponds if acidic conditions are encountered during mining. Potentially acid generating rock will be surrounded by alkaline material during waste rock disposal. No mitigation for pit water or the tailings facility were identified.

The proposed tailings facility would allow 40 gpm of seepage to local groundwater underlying the reservoir. This impact would be long term, resulting in permanent degradation of the local groundwater and potentially of the shallow groundwater flowing toward surface water. Existing groundwater data in the tailings area showed poor quality water with long residence times and very low permeability. Therefore, although the proposed action and alternatives would lead to permanent degradation of localized groundwater, local water supplies would not be impacted, because the groundwater regime in the valley in which the tailings impoundment is located has not been found to be connected to a regional aquifer system, and the dam foundation would penetrate to less permeable material. There was predicted to be no impact to surface water quality under normal operation of the mill facilities.

Possible releases of TDS could occur from the waste rock dump but were planned to be collected in the underdrains, the diversion ditches, or in the sediment impoundment. Modeling indicated that arsenic, nickel, zinc, silver, iron, and copper concentrations would be lower than drinking water standards in surface water. Manganese was predicted to slightly exceed its standard.

The quality of water accumulated in the pit was expected to be of poor quality, with high concentrations of metalloids, heavy metals and major ions, including arsenic, cadmium, iron, lead, manganese, mercury, nickel, boron, sodium, chloride and sulfate. Alkaline-producing materials in the rocks would likely produce alkaline pH conditions in the mine pit water and would tend to reduce metals leached from the rocks. Pit water would not reach surface streams, and no impacts on the quality of surface water were anticipated.

6.3.7.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring data were obtained from the RWQCB in Sacramento for 1982 to 2004 and included the following:

- Baseline water quality data from 1982 – 1986 indicate that groundwater hydraulic conductivity is low and existing water quality poor and groundwater is considered to be unusable. The mine obtained an exclusion for meeting groundwater standards at the site, with groundwater standards set at no increase over background.
- Groundwater monitoring wells downgradient of the tailings impoundment showed increases and exceedences of TDS, chloride, nitrate, and sulfate from ~1984 to ~1992, with increases of copper and other metals during the same period.
- Groundwater monitoring wells downgradient of the waste rock dumps show increasing concentrations of sulfate (in excess of SDWA standards), boron, TDS, calcium, iron, manganese and other constituents from ~1985 to ~1998. Zinc concentrations increased after 1998.
- Surface monitoring locations downstream of the mine show exceedences of sulfate and occasionally large exceedences of arsenic, chromium, copper, lead, manganese mercury, lead, iron and zinc.
- The open pit also receives pump-back water from the waste rock dumps, so water chemistry may also reflect waste rock drainage/leachate. Pit water exceeds secondary drinking water standards for pH (low), TDS, chloride, sulfate, iron and manganese. If pit water discharges to surface water, the elevated concentrations of copper, nickel, and zinc could cause exceedences of standards for the protection of aquatic life.
- No violations were noted. According to the RWQCB, if concentrations chronically exceed standards, enforcement actions are issued. However, apparently due to the regulatory exclusion for groundwater at the site no enforcement actions were taken by the RWQCB despite evidence that groundwater has been chronically degraded below the tailings impoundment and waste rock storage areas. Similarly, no enforcement actions were taken by the RWQCB, despite apparent evidence of chronic degradation of surface water.

6.3.7.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.12 provides a summary and comparison of potential, predicted and actual water quality information for the McLaughlin mine. The accuracy of the predictions is discussed in this section.

Table 6.12. McLaughlin, CA, Potential, Predicted and Actual Impacts
(all information from 1983 EIR/EIS unless otherwise noted; actual impacts from water quality monitoring data)

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings	• Permanent degradation of groundwater is expected, due to tailings seepage	• Monitoring only	• Permanent degradation of local groundwater from tailings, but no impact outside the existing poor quality confined aquifer	• Downgradient wells show increases and exceedences of TDS, chloride, nitrate, and sulfate from ~1984 to ~1992, with increases of copper, and other metals
	Waste Rock	• Possible release of TDS could occur from waste rock dump	• Leachate will be collected in the underdrains, the diversion ditches, or in the sediment impoundment. • Segregation and blending of PAG waste rock.	• Groundwater will not be impacted outside the existing poor quality confined aquifer	• Downgradient wells show increasing concentrations of sulfate (in excess of SDWA standards), boron, TDS, calcium, iron, manganese, and other constituents from ~1985 to ~1998. Zinc concentrations increased after 1998
Surface Water	Tailings	• No impact to surface water quality	• No mitigation identified	• No impact to surface water quality	• Downstream surface monitoring locations show exceedences of sulfate, and occasionally large exceedences of arsenic, chromium, copper, lead, manganese, mercury, iron and zinc
	Waste Rock	• Surface water quality impacts may potentially occur from waste rock o increased sediment o increased total dissolved solids o increased heavy metal concentration	• Lime will be added to sediment ponds if acidic conditions develop • Segregation and blending of PAG waste rock	• Manganese was predicted to slightly exceed its standard	
Pit Water	Open Pit	• Pit water is expected to be of poor quality	• Alkaline pH conditions in the mine pit would tend to reduce metals leached	• Pit water not expected to reach surface streams	Pit water exceeds secondary drinking water standards for pH (low), TDS, chloride, sulfate, iron and manganese

Degradation of Local Groundwater from Tailings and Waste Rock Seepage: The 1983 EIS/EIR identified the potential for permanent degradation of local groundwater from tailings seepage. Release of TDS from waste rock was predicted, but mitigation measures (underdrains, diversion ditches, segregation of PAG rock, lime addition to waste rock runoff) were expected to avoid impacts to groundwater. However, wells downgradient of waste rock show elevated sulfate (up to 5,000 mg/l), boron, TDS, iron, manganese and zinc (up to 1.7 mg/l) concentrations. Therefore, groundwater impacts from tailings were accurately predicted, but predictions for groundwater impacts from waste rock were inaccurate.

Surface Water Impacts: Potential surface water quality impacts from tailings were not expected; however, potential impacts from waste rock were recognized and modeled. Modeled arsenic, nickel, zinc, silver, iron and copper concentrations were predicted to be lower and manganese higher than drinking water standards in Hunting Creek. The modeling results were correct for zinc, silver, manganese and copper, which did not exceed standards but were incorrect for arsenic, nickel and iron, which did exceed standards.

Pit Water Quality: Pit water quality was expected to be poor (with high concentrations of arsenic, cadmium, iron, lead, manganese, mercury, nickel, boron, and sulfate, but alkaline conditions were expected to reduce metal concentrations. The pit water is of poor quality, as predicted. There are elevated concentrations of iron, manganese, nickel, boron, sodium, chloride and sulfate, as predicted, but there are not high concentrations of arsenic, cadmium or lead at this time. The pH of the pit water is 5.08, which is acidic rather than alkaline, so the prediction that the pit water will have an alkaline pH is inaccurate. Pit water quality exceeds drinking water drinking water standards for pH (low), TDS, sulfate, manganese, nickel and boron.

6.3.8. MESQUITE, CALIFORNIA

The Mesquite Mine is owned by Newmont Mining Company and is an open pit, heap leach gold and silver operation. Production started in 1985, and the mine is still in operation. The mine disturbs 3,655 acres of BLM land in the El Centro District, and has a financial assurance amount (last updated in 1998) of $3,048,081.

6.3.8.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA and CEQA were required for the new project to be permitted. A new project EIS was completed in 1984, and two expansion EISs were conducted in 1987 and 2000. The new project EIS (1984) and the 2000/2002 (draft/final) expansion EIS were obtained for this report. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1984 EIS

From a rain gauge 14 miles away, annual precipitation ranged from 1.17 to7.42 inches. Annual rainfall in the Amos basin probably ranges from 3 inches on the valley floor to 5.5 inches in the higher mountains. Mean annual pan evaporation is 137 inches, mean annual lake evaporation is 96 inches. The Coachella Canal, approximately 15 miles southwest of the project area, is the closest perennial surface water feature. Drainages on the site flow only during infrequent thunderstorms. Groundwater occurs in alluvial deposits, and, to a limited extent, in fractures and joint systems in bedrock in the Chocolate Mountains. Average depth to groundwater near the proposed Mesquite mine is 200 feet below ground surface. Depth to groundwater becomes as shallow as 145 feet just south of highway 78.

Alluvium covers a majority of the site. Older rocks include Miocene/Oligocene non-marine silts, sand, angular gravel, with a considerable amount of gypsum, and Mesozoic and Precambrian igneous and metamorphic rocks in the northern part of the site. Static acid-base potential tests were performed on overburden and leached ore. Both overburden and leached ore residue have sufficient neutralizing capacity to prevent any formation of acidic leachate.

Water quality impact potential: Background groundwater quality in the region had exceedences of fluoride in most wells and chloride, sulfate, iron, manganese and arsenic in alluvial wells. Bedrock wells exceeded for iron, manganese, arsenic and mercury. The only potential significant environmental impact to groundwater would be from percolated surface waters containing chemicals used in ore processing, accidental fuel spillage, spillage of reagents or chemicals, breakage of solution pipelines or leachate from waste dumps. Low soil moisture and depth to groundwater present a secondary defense against contamination. Surface water in the Imperial Valley typically has high TDS values, around 990 mg/l. Surface water quality in the project area could be affected by the presence of suspended solids in runoff, hazardous materials accumulated in the processing plant area or by any accidental escape of leach solution from the processing system. There will most likely be pit lakes because pit bottoms will be 400-500 ft deep.

Proposed mitigation include: impermeable liners for leach pads; immediate application of calcium hypochlorite to any spilled/released cyanide on exposed soil; containment area around reagent building; sumps in process building to collect spilled materials; collection and storage for runoff from the heap leach facility; rinsing of heap leach pads upon completion of the leaching; and impervious barriers under areas exposed to toxic chemicals.

Predicted water quality impacts: As a result of implementing the proposed project design and all solution containment measures, no significant adverse impact on groundwater quality is expected. The proposed project design includes measures to prevent any adverse impacts on surface water quality, including the prevention of contamination from the use of dilute cyanide leach solution. No information was provided on discharges to groundwater or surface water.

2000/2002 EIS

Annual precipitation is three inches/ear, and evaporation is ~80 inches/year. The closest perennial surface water feature is the Coachella Canal, located approximately 15 miles southwest of the site. The groundwater flow direction is generally from northeast to southwest, following the surface contours. Prior to mining, groundwater depths ranged from about 200 to 300 feet deep.

Gold ore occurs in gneiss and granitic basement rock in essentially free or native forms. It is concentrated in microfractures in minute sizes and amounts. Minor amounts of silver ore are found disseminated in microfractures of gneiss and granitic basement rock. Static acid-base accounting, whole rock analysis for metals, and 20-week kinetic tests were performed. From whole rock analysis, arsenic, selenium, silver, bismuth and thallium were identified as potential constituents of concern. Rock types encountered in the Rainbow and north half sections were typically net neutralizing. The kinetic tests were inoculated with *Thiobacillus ferrooxidans* and showed no acid generation or any indication that acid would form. The kinetic tests indicated that even the most sulfidic members of the hornblende biotite gneiss and mafic gneiss rock units are not likely to generate acid. Soluble metals concentrations in the overburden/interburden were generally low. A hydrologic/hydraulic evaluation of runoff was conducted using the runoff model HEC-1. Pit water quantity and quality modeling was conducted by Baker Consultants.

Ore processing operations could leak or spill processing fluids if they are not properly designed, constructed and operated. Petroleum products could impact groundwater if a substantial leak were to occur. Infiltrating precipitation could carry soluble constituents from the overburden/interburden to groundwater. Increased runoff could occur from road surfaces during infrequent large storms, but roads cover only a small fraction of the site. The potential exists for minor hydrocarbon leaks/spills from equipment. Water quality in the existing pit lake is generally alkaline (pH 8.3 - 8.9), slightly to moderately saline (total alkalinity 258 - 334 mg/l of $CaCO_3$, TDS 1,400 - 3,600 mg/l) and low in dissolved trace metals. Initially, the pit water chemistry will be similar to the existing pit water, with TDS in the 1,500-400 mg/l range. At equilibrium, TDS is expected to reach 5,000-10,000 mg/l. Long term pit chemistry will be the same as the existing pits.

Proposed mitigation for the expansion include: heap leach pad liner and leak detection system; monitoring; storage of bulk petroleum products above ground in designated areas with secondary containment and leak detection. Best Management Practices will minimize stormwater-related pollution and include monitoring and inspection protocols to gauge their effectiveness. Ore processing facilities will have run-on controls and will be operated in a manner that protects against release of process fluids or other constituents that may adversely affect surface water quality.

Groundwater quality was evaluated over five years for pH, specific conductance, temperature, total dissolved solids, arsenic, copper, iron, sulfate and nitrate/nitrite. None of the parameters showed trends of adverse change in water quality. There are no known groundwater quality impacts from the 15 years of activity that have occurred at the Mesquite Mine to date. Modeling indicates that for the out-of-pit configuration, groundwater would not flow through any of the mine pits, so the build up of dissolved constituents in the pit lakes will not affect water quality away from the mine pits. With petroleum containment and monitoring in place, fuels and oil use at the site are not expected to impact groundwater quality. Because soluble metals concentrations in waste rock are generally low and the material is not acid generating, and because of the low annual precipitation, waste rock would not have a significant impact on

groundwater quality. With heap leach pad operation requirements in place, significant effects to surface water quality are not expected. The likelihood of spills is small, and they would be easily removed. Long term pit chemistry is expected to be the same as the existing pits. No information was provided on discharges to groundwater or surface water.

6.3.8.2. ACTUAL WATER QUALITY CONDITIONS

The information on actual water quality conditions is based on a phone call with the RWQCB in Palm Desert, California, in September 2004. The Mesquite Mine is still conducting leaching operations but is otherwise shut down. There was one unreported spill in early 2003/late 2002, and a violation was written by the RWQCB. However, this was a very minor spill. Quarterly reporting is required for TDS, total and free cyanide, pH, sulfate, arsenic, gold, silver, copper iron, and nitrate. No major problems, for example with cyanide, have occurred.

6.3.8.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.13 summarizes potential, predicted and actual impacts for the Mesquite Mine. A spill did occur in 2002/2003. The potential for spills was recognized in both the 1984 and 2002 EISs, but because of mitigation measures, they were expected to be cleaned up rapidly and not affect groundwater or surface water. To date, this prediction has been true.

Table 6.13. Mesquite, CA, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	• Heap leach facility • Waste rock	• Ore processing fluids, fuel or chemical spills, pipeline breaks, waste rock leachate (1984) • Leaks or spills of ore solution, petroleum leaks, leachate from waste rock (2002)	• Leach pad liners, calcium hypochlorite applied to cyanide spills, rinse pads after mining (1984) • Heap leach pad liner/leak detection, monitoring, storage of petroleum products in areas with secondary containment, leak monitoring (2002)	• No impact to groundwater (1984) • No impacted predicted because existing groundwater quality unchanged and fuels/oil containment/monitoring. Waste rock would no have significant impact. (2002)	• Spill occurred, but no impacts to groundwater occurred.
Surface Water	• Heap leach facility	• Erosion of soils, processing plant materials, ore solution leachate (1984) • Runoff from roads, fuel spills	• Reagent containment and sumps, heap leach runoff controls (1984) • Stormwater BMPs, monitoring, heap leach run-on controls (2002)	• No impact to surface water quality (1984) • No significant surface water quality effects expected from heap leach pad or spills (2002	• Spill occurred, but no impacts to surface water occurred.
Pit Water	• Open pit	• Pit lakes will exist (1984) • Long-term pit chemistry same as existing pits (2002)	• None	• No information (1984) • Long-term pit chemistry expected to be same as existing pits.	• None

6.3.9. ROYAL MOUNTAIN KING, CALIFORNIA

The Royal Mountain King Mine is owned by Meridian Gold, Inc. and was in operation from 1990 to 1995. The primary commodity mined was gold from open pit mining and vat leach processing operations. It disturbed 650 acres on private land. It has a current financial assurance amount of $3.3 million.

6.3.9.1. WATER QUALITY PREDICTIONS SUMMARY

El Dorado County was the lead agency under CEQA for the new project to be permitted, and an EIS/EIR was completed in 1987. NEPA/CEQA was not required for the NPDES discharge permit. The following sections summarize the water quality predictions made in the documents reviewed.

1987 EIS/EIR

The EIS/EIR contained very little information on geochemical characterization tests (only static acid-base accounting tests were performed) and did not identify any particular constituents of concern. Based on static acid-base accounting test results, the EIS/EIR concluded that there was no net acid forming potential associated with the overburden materials. No information was provided on contaminant leaching potential. The EIS/EIR stated that the waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system. No information was provided on mitigation, with the exception of stormwater management approaches.

Additional Information

1988 Geochemical Characterization Testing by Donald R. Baker

Geochemical characterization testing consisted of total digestions of tailings and waste rock samples (results were compared to Total Threshold Limit Concentrations (TTLC)), WET tests on waste rock (results were compared to Soluble Threshold Limit Concentrations (STLC)), and a Deionized Water Extraction test on waste rock. Total digestion leachate values for tailings were elevated for antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, vanadium and zinc (>10 to 100 times MCL/SMCL values). Total digestion and WET test values for waste rock leachate were elevated for antimony, arsenic, beryllium (total digestion only), cadmium (total digestion only), chromium, cobalt, copper, lead, mercury (total digestion only), nickel, silver (total digestion only), vanadium (total digestion only) and zinc. Deionized water extract concentrations for waste rock were elevated for arsenic.

1987 Report of Waste Discharge

According to the report, three different types of ore will be mined in the project. The Skyrocket ore body, which comprises roughly 59% of the total reserves, is a refractory (unoxidized) carbonaceous deposit. Mountain King, which comprises 30% of ore reserves, is predominantly unoxidized. Gold Knoll, the remaining 11% of reserves, is a mix of oxidized and unoxidized ore.

There will be three sources of solid waste generated on the property: overburden; flotation tailings; and heap leach concentrate residues. Each type of waste was subjected to: acid-base accounting (hot hydrogen peroxide oxidation); total metal content; short-term leach (WET, DI water extract); sulfuric-acid extractable metal concentration for samples with acid-forming potential; and bioassay studies on all wastes except overburden. The testing results showed the contaminant potential to be high for all materials.

Overburden. Deionized water extractions on waste rock material showed several exceedences of drinking water standards. Arsenic concentrations in the extract exceeded drinking water standards (10 μg/l) by over 10 times, and selenium concentrations in leachate from one sample were elevated but did not exceed the drinking water standard. Total chromium concentrations exceeded the drinking water standard by almost two times. For the WET test results,

leachate concentrations in samples from all four types of overburden exceeded the drinking water standard for arsenic by factors of 2 to 26, and chromium concentrations also exceeded drinking water standards in all four waste rock types ranging from a factor of 1.5 to 3. Nickel concentrations also exceeded drinking water standards in all four samples, with concentrations ranging between 4 to 7 times the remanded standard of 100 µg/l.

Flotation Tailings. WET test leachates for all four tailings lithologies (one from each pit, as well as a composite) showed drinking water exceedences for arsenic, barium, total chromium, lead, and nickel; the detection limit for mercury in the WET leachate was too high to conduct comparisons to standards. There was also a single exceedence (from the Mountain King pit) for selenium. In the deionized water extraction, there was one drinking water exceedence for selenium in a leachate sample from the Mountain King pit, and one exceedence of arsenic, also from the Mountain King pit. Arsenic levels in the DI extraction leachate were equal to the drinking water standard in the Gold Knoll pit sample. Arsenic concentrations in the DI extraction leachate exceeded the drinking water standard in all four floatation tailings samples by a factor of 2 to 3. Lead concentrations in the DI leachate were elevated but did not exceed the drinking water standard. Nickel concentrations exceeded the remanded drinking water standards in DI leachate from the Mountain King pit sample.

Leached Concentrates (Heap Leach Ore). Arsenic concentrations in the heap leach concentrates were high enough to classify this material as hazardous waste, according to the TTLC. In the deionized water extraction of the leached concentrates, antimony concentrations exceeded the drinking water standard by a factor of more than 10 in all four samples (each pit, as well as a composite sample). Arsenic concentrations exceeded the new standard in all four samples by factors of fewer than 2 to almost 3. The detection limit for lead exceeded current standards. Mercury concentrations exceeded the standard in the Gold Knoll pit sample. Nickel concentrations exceeded the remanded drinking water standard by a factor of almost two in the Sky Rocket sample and was at the standard in the composite sample. In addition, results from the extraction procedure utilizing citric acid (WET test) showed elevated concentrations of antimony, arsenic, lead and nickel from all samples. The lead levels in the Mountain King pit samples were high enough compared to the STLC to merit classifying the heap leach concentrates as a hazardous waste. Extractions using H_2SO_4 produced results similar to the DI water extraction. The leached transport solution exceeded, by a factor of over one hundred, the drinking water standards for arsenic, copper, cyanide and mercury, TDS, and nickel concentrations exceeded drinking water standards in the transport solution by 10 times or more. Lead, silver, sulfate and zinc concentrations in the leach transport solution exceeded drinking water standards by one to 10 times. Detection limits for cadmium, chromium, silver and thallium for leach transport solutions were higher than their respective water quality standards.

Acid Drainage Potential. All overburden lithologies and flotation tailings samples had excess neutralization potential. NP:AP ratios were approximately 40:1 or higher, indicating that acid generation was unlikely. However, acid generation potential was high in the concentrates from the heap leaching circuit, with NP:AP ratios ranging from 1:3 to 1:12.

According to the report, the tailings impoundment will not require an engineered lining. Both the solids and the liquid in the slurry were tested extensively and do not present any potential for having an adverse impact on the environment. In addition, the rocks underlying the tailings impoundment have low permeabilities.

6.3.9.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring data were obtained from the RWQCB in Sacramento for 1987 to 2004 and included the following:

- Tailings wells showed exceedences of drinking water standards for chloride, nitrate, nickel, selenium, sulfate, TDS and manganese. Heap leach concentrate area wells had exceedences of drinking water standards for antimony, arsenic, chromium, manganese, copper, nickel, nitrate, selenium, sulfate, TDS, and total and WAD cyanide. Waste rock wells showed exceedences of drinking water standards for nitrate, TDS, sulfate, arsenic, chloride and selenium.

- Surface water monitoring showed exceedences of drinking water standards for nitrate, sulfate, TDS and arsenic.
- Pit water monitoring shows exceedences of sulfate and TDS SMCL values in North Pit; exceedences of arsenic, sulfate, TDS, and chloride drinking water standards in Skyrocket Pit.
- The mine area has been subject to historic mining, so background water quality (pre-historic mining) is difficult to determine. There are some artesian salt springs in the marine deposits, but not all groundwater is salty. Skyrocket Pit outlet flows to Littlejohns Creek. The mine claims that elevated groundwater concentrations are background levels. Some of the groundwater is very salty, but the chemical signature from the waste rock piles is still apparent. The RWQCB proved, using Piper diagrams, that the groundwater had changed over time as a result of mining activity (RWQCB interview, 10/15/04).
- There were 29 violations issued to the mine from the RWQCB from January 1993 to August 2004; between nine and 12 of them were related to water quality or quantity problems, and the remainder were related to inadequacies in reporting and other non-water quality issues. The State Water Control Board, not the RWQCB, vacated the 2003 cease and desist order, agreeing with the mine that it was too complex, and the State Board was not sure the mine could comply with the order. If the order had been kept, the mine would be in violation all the time. The RWQCB feels that the financial assurance is too low because it does not include foreseeable future releases.
- Local public interest groups have sued Royal Mountain King for discharges to Littlejohns Creek (from Skyrocket Pit) and for the presence of elevated arsenic, ammonia and cyanide in groundwater. The lawsuit requests a cease and desist order and containment.
- Meridian Gold received the California Mining Association Reclamation Award in 1994.

6.3.9.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.14 provides a summary and comparison of potential, predicted and actual water quality information for the Royal Mountain King mine. The accuracy of the predictions is discussed in this section.

Groundwater Impacts from Tailings: The 1987 EIS/EIR did not address potential impacts from tailings but did state generally that waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system. The 1987 Report of Waste Discharge (RWD) found that tailings do not have the potential for impacts, that low permeability material below the impoundment was sufficient mitigation, and therefore no engineered lining was required. However, water quality monitoring results from wells downgradient of the tailings impoundment showed exceedences of drinking water standards for sulfate, chloride, nitrate, nickel, selenium, TDS and manganese. Therefore, the potential impact information for tailings presented in the EIR was accurate, but the predictions based on the low permeability material were inaccurate and resulted in inadequate mitigation measures being taken at the site.

Groundwater Impacts from Waste Rock: The 1987 EIS/EIR determined, based on the results of static testing, that there was no net acid forming potential associated with waste rock. The RWD found that the waste rock was not considered hazardous. Short-term leach test leachate exceeded drinking water standards for arsenic, selenium, chromium and nickel. Water quality monitoring results from wells downgradient of waste rock showed exceedences of drinking water standards for nitrate, total dissolved solids, sulfate, arsenic (up to 1,400 µg/l), chloride and selenium. Therefore, predictions for groundwater impacts from waste rock were accurate for arsenic and selenium, but not for chromium and nickel. In addition, short-term leach testing results did not predict the observed exceedences of nitrate, TDS, sulfate and chloride.

Arsenic concentrations were increasing steadily from 1987 to 2004. Nitrate, TDS, sulfate, chloride and selenium concentrations were not predicted to be elevated but were (if they were monitored). The other constituents that were predicted to be elevated in waste rock leachate are not elevated in groundwater downgradient of the waste rock storage areas at this time. Pit water (Skyrocket Pit) has elevated concentrations of antimony, arsenic, nickel, sulfate and TDS. All of these except sulfate and TDS were predicted based on short-term leach results for waste rock.

Groundwater Impacts from Heap Leach Facility: The 1987 EIS/EIR stated generally that waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system. The RWD found

Table 6.14. Royal Mountain King, CA, Potential, Predicted and Actual Impacts
(all information from the 1987 EIR/EIS unless otherwise stated; actual impacts information from water quality monitoring data)

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings	• Waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system.1987 RWD: Tailings do not present any potential for adverse impact to the environment, underlying rocks have low permeability.	• RWD: Tailings impoundment will not require an engineered liner	• No information.	Tailings wells show exceedences of drinking water standards for chloride, nitrate, nickel, selenium, sulfate, TDS, manganese.
	Waste Rock	• No net acid forming potential associated with the overburden materials	• Only stormwater controls		• Waste rock wells show exceedences of drinking water standards for nitrate, TDS, sulfate, arsenic, chloride, selenium.
	Heap Leach Concentrate	• Waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system. RWD: Short-term leach tests solution would be elevated in Sb, As, Cu, CN, Pb, Hg, SO4, TDS, Zn.	• None identified. RWD: liner required.		• Heap leach area wells show exceedences of drinking water standards for antimony, arsenic, chromium, manganese, copper, nickel, nitrate, selenium, sulfate, TDS, total and WAD cyanide.

that arsenic and lead concentrations in the heap leach concentrates were high enough to classify them as hazardous waste; therefore, a liner was required. Short-term leach tests predicted that heap leach concentrate solution would be elevated in antimony, arsenic, copper, cyanide, lead, mercury, nickel, sulfate, TDS and zinc. Groundwater downgradient of the leach pad facility showed exceedences of drinking water standards for antimony, arsenic, chromium, manganese, copper, nickel, nitrate, selenium, sulfate, TDS, total and WAD cyanide. Of these, antimony, arsenic, copper, nickel, sulfate, TDS and cyanide were predicted to be elevated. Chromium, manganese, nitrate and selenium concentrations were not predicted to be elevated or were not evaluated, but they were elevated in wells downgradient of the heap leach facility. Therefore, the potential water quality concerns were accurate (in particular,

arsenic was released from the lead pad materials), but the designated mitigation (liner) did not prevent the contamination of downgradient groundwater.

6.3.10. GROUSE CREEK, IDAHO

The Sunbeam Mine, owned by Sunbeam Mining Company, began operations in 1984. The Hecla Mining Company began mining the Grouse Creek and Sunbeam deposits in 1994 and operated until its closure in 1997. The primary commodities mined were gold with some silver from open pit mining, with heap leach and vat leach processing. It disturbs 524 acres on private land and Challis National Forest lands in Forest Service Region 4. It has a financial assurance amount of $7,038,945.

6.3.10.1. WATER QUALITY PREDICTIONS SUMMARY

The Challis National Forest has been the lead agency for all NEPA actions at the Ground Creek Mine. NEPA was required for the new project to be permitted, and an EIS was completed in 1984. The EIS was also utilized by the EPA in issuing the NPDES discharge permit. A subsequent EIS for mine expansion was completed in 1992. The following sections summarize the water quality information and predictions made in the NEPA documents reviewed.

1984 EIS

The 1984 EIS describes the deposit as a gold and silver ore containing pyrite and iron oxides. Acid drainage was observed from the Sunnyside Mine adit (pH range of 3.3 to 3.9) on the study site, indicating the presence of acid drainage. However, the EIS stated that the potential for generating significant acid drainage from mine or waste dumps is minimal, based on the fact that very little sulfide material is available within the ore body and that "weather tests" indicated that the pH of the drainage of mine-run samples is stable. The acid drainage that has been reported from the abandoned Sunbeam Mine portal (pH 3.2) may be a result of an isolated sulfide-bearing stratum within the mine area itself that is exposed to localized oxidation conditions due to variation in the water table within the mine area. The EIS stated that the proposed Grouse Creek open pit will not be subject to the same conditions that can cause the formation of acid drainage. Mitigation identified included surface water controls and surface water and groundwater monitoring. Cyanide was identified as a constituent of concern.

1992 SEIS

The 1992 Supplemental EIS identified the gold and silver ore deposit as containing gold, native silver, electrum, metal sulfides, including pyrite, and iron oxides. Results of geochemical testing (including sulfur analysis, static ABA and short term leach tests) indicated that moderate acid drainage was expected. Metals, metalloids, and other contaminants (nitrate and cyanide) were identified as constituents of concern; however, EP toxicity analysis of waste rock samples indicated the potential for heavy metal concentrations in leachate to be "relatively low," with lead being the only metal expected to exceed drinking water MCLs, as long as the water maintained a low to moderate acidity. The potential for significant groundwater degradation was determined to be minimal, and the potential for cyanide entering groundwater in sufficient quantities to do real harm was described as very minimal, but the potential does exist.

Source controls for groundwater capture and treatment and storm water controls were required during operations. There is a potential for some drainage from the Grouse Creek pit to occur post-reclamation, but the water is not expected to be acidic because of the buffering capacity of the carbonate-rich rocks.

6.3.10.2. ACTUAL WATER QUALITY CONDITIONS

Hecla experienced financial difficulties at the same time that water quality issues became noticeable. In 2000 the Grouse Creek Mine was declared a Forest Service Superfund site, and in 2002 an Engineering Evaluation/Cost

Analysis (EECA) for Non-time Critical Removal Action was performed at the Grouse Creek Mine Site. The following information was taken from the EECA.

Hecla Mining Company has been monitoring water quality since 1987. In 1995 cyanide was detected in both surface water and groundwater monitoring stations. Cyanide detection in wells below the South Embankment indicated that contaminated water was moving through the underlying materials below the tailings impoundment. Cyanide was periodically detected in Jordan Creek below the constructed wetlands. Since 1999, cyanide (total and WAD) concentrations have decreased in Jordan Creek. Since 2001, cyanide (WAD) concentrations have mostly been below detection limits (0.002 mg/l).

Chemicals of Potential Concern identified in tailings pore water included aluminum, copper, arsenic, selenium, silver, zinc, cyanide, ammonia and mercury. Constituents that exceeded acute water quality criteria for protection of aquatic life included aluminum, copper, arsenic, selenium, silver, zinc and cyanide. Sampling data showed trends toward generally improving tailings impoundment water quality when the EE/CA was written. WAD cyanide concentrations were decreasing and were predicted to decline to less than 0.0025 mg/l by April 2002. Ammonia concentrations were declining steadily in tailings impoundment water and were predicted to be below 25 mg/l in 2003 and below 20 mg/l in 2004. Silver concentrations were declining, and concentrations at most sampling sites currently are below the detection limit (0.0005 mg/l). Copper concentrations have declined to an average of 0.04 mg/l since Fall 2000, and mercury concentrations were below the detection limit of 0.0002 mg/l. Total nitrate concentrations were increasing steadily, possibly due to metabolism of ammonia by microbial biomass.

Some contamination of groundwater is still evident at the site. However, since 2001, all contaminants of concern entering the Yankee Fork receiving water were below detection limits. Detectable cyanide (WAD and total) concentrations were last measured in Jordan Creek in June 2000.

6.3.10.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.15 provides a summary and comparison of potential, predicted and actual water quality information for the Grouse Creek Mine. The accuracy of the EIS water quality predictions is discussed in this section.

Table 6.15 Grouse Creek, ID, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings and Waste Rock	• 1984 EIS: acid drainage observed but geochemical tests indicated minimal acid drainage potential • 1992 SEIS: Moderate acid drainage potential; low risk of significant groundwater contamination but potential impact to surface water from tailings	• 1984 EIS: stormwater controls and water monitoring • 1992 SEIS: stormwater controls and groundwater capture and treatment during operations; reclamation with buffering rock; composite liner system for tailings impoundment; French drains under waste rock dumps	• 1984 EIS: no impacts to water quality • 1992 SEIS: no impacts to water quality; adverse water quality effects from impoundment leakage unlikely due to underdrain and collection system	• EE/CA: tailings impoundment leakage into groundwater resulted in CN in groundwater and surface water. Tailings pore water exceeds standards for aluminum, copper, arsenic, selenium, silver, zinc and cyanide.

Cyanide in Groundwater and Surface Water. Cyanide was identified as a constituent of concern in both the 1984 and the 1992 EISs. The potential for contamination of groundwater by cyanide was recognized in the 1992 SEIS, but the actual potential was described as very minimal. Short-term leach tests performed for the 1992 SEIS indicated metal concentrations in leachate would be low with only lead predicted to exceed drinking water MCL's as long as the water maintained a low to moderate acidity. The EE/CA showed that the tailings liner failed to contain the tailings solutions and the underlying French drain system did not capture all tailings leakage, resulting in contamination of groundwater and surface water with cyanide and other contaminants. Although the potential for cyanide contamination of groundwater and surface water was noted in the 1992 SEIS, adverse water quality effects from impoundment leakage was wrongly thought to be unlikely due to mitigation such as the underdrain and collection system. Therefore, the observed impact to groundwater and surface water from tailings leakage was not predicted.

6.3.11. THOMPSON CREEK, IDAHO

The Thompson Creek Mine, owned by Thompson Creek Mining Company, has been in operation since 1983. The primary commodity mined is molybdenum from open pit mining and flotation processing operations. It disturbs 2,100 acres on Salmon-Challis National Forest lands in U.S. Forest Service Region 4, BLM administered land, and private land. It has a current financial assurance amount of $11.3 million.

6.3.11.1. WATER QUALITY PREDICTIONS SUMMARY

The Salmon-Challis National Forest has been the lead agency for all NEPA actions at the Thompson Creek Mine. NEPA was required for the new project to be permitted, and an EIS was completed in 1980. NEPA was not required for the NPDES discharge permit. In 1999 a Supplemental EIS was conducted for a plan of operation change dealing with tailings disposal. The following sections summarize the water quality information and predictions made in the NEPA documents reviewed.

1980 EIS

The 1980 EIS cites laboratory tests to characterize leachate, determine weathering effects over 20 years, and determine the quantity of acid the waste rock would consume. The specific nature of the tests and test results were not provided. The tests indicated that there was sufficient buffering capacity to neutralize acid drainage and that leachate would not contain significant concentrations of contaminants. The EIS stated that such conditions would continue for 20 years, but no basis is provided for the prediction.

The 1980 EIS did note a concern that water infiltrating waste dumps will leach materials in toxic concentrations from waste rock and that these will reach surface water. The EIS also noted that infiltration from the tailings impoundment could exceed EPA drinking water standards for iron, manganese, nitrate TDS, and zinc, which could cause Bruno Creek to exceed water quality criteria during low flow.

No acid drainage characterization tests were conducted for tailings, and according to the EIS, the tailings would be similar to low-grade ore, which did not indicate potential for acid drainage. However, tailings leachate tests showed potential for elevated levels of iron and manganese in excess of drinking water standards, and iron and zinc concentrations in excess of EPA criteria for protection of aquatic life. According to the EIS, the areal extent of potential groundwater contamination was unknown, and potential increases of metal concentrations in surface water could occur but would be similar to background levels due to dilution and biological activity. The general prediction of the 1980 EIS was that acid drainage would not occur at the Thompson Creek mine.

1999 EIS

According to the 1999 EIS, in 1988 visual signs of acid drainage were observed in the mine pit and the face of the tailings impoundment. The presence of acid drainage was subsequently confirmed in the mine pit and tailings impoundment, and in 1990 a geochemical characterization program was initiated.

Tailings Impoundment

Tailings and tailings embankment samples were collected and subjected to total sulfur, pyrite sulfur and neutralization potential analyses. In addition, selected samples were subjected to kinetic testing. Static testing results showed an average sulfur content of 0.8%, average acid neutralization potential (ANP) of 6 tons/kiloton (t/kt), acid generation potential (AGP) of 24 t/kt , net neutralizing potential (NNP) of 19 t/kt, and the average ANP/AGP ratio was 0.3 in embankment samples. Slimes (interior tailings) samples had an average ANP of 8 t/kt, NNP of 0.4 t/kt and an ANP/AGP ratio of 1.0. The EIS concluded that the static tests indicated the potential for acid drainage in embankment tailings and less potential in slimes tailings due to saturated conditions in the tailings impoundment. The acid drainage potential was confirmed by kinetic testing, with several samples producing acid drainage during the initial test cycles.

The Draft EIS contained predictions of tailings effluent water quality based on various mitigation for periods of up to 1,500 years. The potential for impacts to Squaw Creek were noted. The final EIS predictions were limited to a 100-year period and were based on results from the PYROX model. The predictions were based on assumptions that the interior slimes tailings would remain saturated (immersed in water) and the tailings would therefore not be reactive and produce acid drainage. The exterior (sand) embankment materials were expected to have excess neutralization capacity at the end of the 100-year simulation, although they could produce acid drainage beyond the 100-year period. The model results are based on the assumption that 140 feet of pyrite-depleted flotation tailings would be placed over the entire embankment surface (with pyrite enriched tailings located in the interior of the embankment). The Draft EIS predictions showed potential for acid drainage generation in 300 to 1500 years, but no impact on surface water quality was predicted, based on PHREEQE surface water quality modeling results.

Waste Rock

Waste rock samples representing various geologic units were collected and subjected to static and kinetic testing. Static testing indicated that volcanic waste rock was not acid generating, with average ANP/AGP ratio of 30:1 and an NNP of 20.6 t/kt. Static and kinetic testing on metasedimentary and intrusive rocks indicated the potential for acid drainage generation.

Long-term water quality of waste rock leachate was predicted based on geochemical testing, seepage rate predictions and existing water chemistry. HELP model simulations were used to predict the rate of seepage from the waste rock dumps. No significant acid drainage, metals leaching or impacts to surface water were expected. According to the EIS, based on existing water quality of dump effluent, the "excess" neutralization potential (from calculations on a "tonnage weighted basis," the NP:AP ratio of the waste rock is 1.5 to 3.1) and assuming mixing in surface waters.

According to the EIS, any acid-producing rock would be mitigated by special handling (segregation) and isolation techniques that are "demonstrated by their use throughout the mining industry." Potentially acid-generating waste material will be identified, placed in zones within the waste dumps and covered with compacted covers, with a final graded cap placed over the dump to reduce infiltration. Based on the mitigation employed, water quality impacts are not anticipated for either groundwater or surface water at the Thompson Creek Mine, according to the EIS.

Pit Lake

The EIS acknowledged that pit water quality may be characteristic of acid drainage and have high concentrations of molybdenum, iron and manganese. No studies had been conducted at the time of the EIS to quantitatively predict pit

lake water quality. The EIS suggests that the pit will act as a terminal groundwater sink, thereby resulting in no impacts to local groundwater or surface water.

6.3.11.2. ACTUAL WATER QUALITY CONDITIONS

According to the 1999 EIS, water quality sampling errors from 1981 to 1990 prevented a reliable baseline water quality evaluation. More recent data (1991 to 1995), the interpretation of which is highly qualified in the EIS, indicated elevated levels of cadmium, copper, lead, sulfate and zinc in surface water, possibly at levels exceeding acute or chronic aquatic life standards. Tailings seepage water quality showed increases in iron, zinc and alkalinity, which, according to the 1999 EIS, were predicted in the 1980 EIS.

According to the 1999 EIS, from 1989 to 1995, sulfate concentrations in creeks downgradient of the waste rock dumps increased from 100 mg/l to 500 mg/l in one case and from 300 mg/l to 1,000 mg/l in another case. No significant changes in other parameters were so far indicated.

Monitoring of seepage from the Buckskin and Pat Hughes waste dumps indicated sulfate and selenium levels were rising since 1991. Selenium concentrations exceeded water quality standards in the seepage from both waste dumps. Thompson Creek has been ordered to meet water quality standards for selenium by the expiration date of its present NPDES permit (Dave Chambers, Center for Science in Public Participation, personal communication, 2005).

6.3.11.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.16 provides a summary and comparison of potential, predicted and actual water quality information for the Thompson Creek Mine. The accuracy of the predictions is discussed in this section.

Acid Drainage and Metal Leaching from Tailings and Waste Rock, Including the Open Pit: The 1980 EIS did not indicate acid drainage potential for either tailings or waste rock but did indicate metals leaching potential in tailings and waste rock. Pit lake water quality was predicted to be typical of oligotrophic mountain lakes. The 1999 EIS indicated acid drainage potential in tailings and waste rock, but acid drainage from tailings was not predicted for at least 100 years. The pit lake was predicted to be contaminated by acid drainage but was expected to act as a terminal sink and create no impacts on local water resources. Therefore, the potential for acid drainage was initially underestimated and subsequently predicted to take longer to develop than it did. However, the potential for metal leaching was noted in both EISs.

Elevated Concentrations of Metals and Sulfate in Surface Water: The 1980 EIS stated that water infiltrating the waste dumps could potentially leach materials in toxic concentrations that would reach surface water, and infiltration from the tailings impoundment could cause Bruno Creek to exceed water quality criteria during low flow. This EIS predicted moderate surface water quality impacts after mitigation were in place. The 1999 EIS noted potential impacts to water quality in Squaw Creek, but predicted no impacts to surface water after mitigation were in place. Therefore, potential (pre-mitigation) impacts were closer to actual impacts, and the degree of success of mitigation measures was overestimated, especially in the 1999 EIS.

Table 6.16. Thompson Creek, ID, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings	• 1980 EIS: No acid drainage potential but metals leaching potential • 1999 EIS: acid drainage potential in tailings	• 1980 EIS: dilution and biological activity • 1999 EIS: saturated conditions in the tailings impoundment to result in less acid drainage potential in slimes tailings	• 1980 EIS: water quality will be similar to background levels • 1999 EIS: acid drainage not predicted for at least 100 years	• Acid drainage observed in 1988 and confirmed in the tailings embankment Tailings seepage water had increases in Fe, Zn and alkalinity
	Waste Rock	• 1980 EIS: No acid drainage or contaminant potential • 1999 EIS: acid drainage potential in waste rock	• 1980 EIS: No mitigation identified • 1999 EIS: segregation and blending of PAG waste rock	• 1980 EIS: No impacts predicted • 1999 EIS: No impacts to groundwater predicted	• Buckskin and Pat Hughes waste dump seepage - rising SO_4 and Se levels since 1991
Surface Water	Tailings	• 1980 EIS: No potential for surface water impacts identified	• 1980 EIS: No mitigation identified	• 1980 EIS: No impacts predicted	• Elevated levels of Cd, Cu, Pb, SO_4 and Zn in surface water (1991-1995) • Increasing downstream SO_4 concentrations (100 to 500 and 300 to 1,000 mg/l), 1989 to 1995
	Waste Rock	• 1980 EIS: No potential for surface water impacts identified • 1999 EIS: acid drainage potential in waste rock	• 1980 EIS: No mitigation identified • 1999 EIS: segregation and blending of PAG waste rock	• 1980 EIS: No impacts predicted • 1999 EIS: No significant acid drainage or metals leaching or impacts to surface water are predicted	
Pit Water	Open Pit	• 1980 EIS: No potential for pit water impacts identified • 1999 EIS: pit water quality may be characteristic of acid drainage and have high concentrations of contaminants	• 1980 EIS: No mitigation identified • 1999 EIS: Pit will be terminal sink	• 1980 EIS: No impacts predicted • 1999 EIS: no impacts on local groundwater or surface water	• Visual signs of acid drainage observed/confirmed in mine pit (1988)

6.3.12. BEAL MOUNTAIN, MONTANA

The Beal Mountain Mine, owned by Pegasus Gold Mining Company, was in operation from 1989 to1998. The primary commodities mined were gold and silver from open pit mining, and heap leach processing was used. It disturbs 429 acres on Deerlodge National Forest in U.S. Forest Service Region 1. Due to ongoing water discharge issues and lawsuits from local public interest groups, the site was declared a Forest Service CERCLA site in 2003 and has been the subject of on-going remediation efforts since that time. The bond in 1998, when Pegasus Gold Mining Company went bankrupt, was $6.3 million. To date, the State of Montana and Forest Service have spent in excess of an additional $6 million in remediation costs.

6.3.12.1. WATER QUALITY PREDICTIONS SUMMARY

The Deerlodge National Forest and Montana Department of Environmental Quality (formerly Department of State Lands) were the lead agencies for NEPA and Montana Environmental Policy Act (MEPA) actions at the Beal Mountain Mine. NEPA was required for the new project to be permitted, and an EA was completed in 1988. In 1993 an EIS was conducted for mine expansion. The NPDES permit was not required or part of the NEPA/MEPA action

for the original operations, which were supposed to be zero discharge. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1988 EA

According to the EA, the sulfide content of the ore ranged from 3 to 8% (pyrrhotite, pyrite, chalcopyrite, with traces of molybdenite and arsenopyrite), but a rind of clay and /or iron oxides enclosing fresh sulfides in a cherty matrix account for low acid production. Geochemical characterization tests conducted included whole rock analysis, ABA and EP Toxicity tests. Constituents of concern identified included arsenic, cadmium and lead. Results of the acid-base testing indicated the waste rock would not generate acidic waters and would not be a significant source of metals due to the low sulfide content of the waste material and the large acid-buffering capacity of the majority of the waste rock. Tests on waste rock indicated that a leachate developed under acidic conditions would be innocuous. Impact from residual cyanide from the leaching process was predicted to be minor.

Mitigation identified in the EA included diversion of stormwater and collection of pit water for process use. The leach pad and solution ponds would be lined and have either a blanket drain or leak detection system that would be monitored. The pit would be backfilled, underlain by a layer of limestone and gravel and be free-draining, resulting in no pit lake. The leach pad would be rinsed to address residual cyanide followed by natural degradation, dilution and "mobilization." Water quality impacts from the leach pad were expected to be minor and probably unpredictable.

1993 EIS

The 1993 mine expansion EIS included geochemical characterization testing, including static ABA, short term leach tests (EPA Method 1310), kinetic tests (15 week humidity cell tests) and trace element analysis. Constituents of concern identified include nitrate, sulfate, cyanide, increased sediment and TDS. Due to the presence of pyrite, pyrrhotite and iron disulfides associated with the deposit, the potential for acid production exists. Geochemical material characterization tests for the main Beal and South Beal deposits indicate a low potential for acid formation. However, the release of sulfates and metals into surface waters is still considered to be a possibility, and these substances could become mobile regardless of acid production. Kinetic testing (humidity cell tests) was conducted for 15 weeks, and the results indicated that the South Beal quartzite waste would not be acid producing. Samples of main Beal waste with higher sulfide content were chosen to test a worst-case scenario, and static tests showed that the potential for acid generation exists for these samples. Leachate extraction tests resulted in no metals concentrations exceeding regulatory limits, and metals mobility was predicted to be minimal. Results from static tests on heap leach material suggested an uncertainty as to whether sulfate release and metals leaching would eventually become a concern. Results from kinetic tests on the heap leach material showed sulfate release for all samples, indicating a possibility for oxidation of pyrite. A chemical analysis of humidity cell leachate after week nine indicated the possibility of arsenic mobility.

According to the EIS, successful reclamation would minimize any potential for impacts to groundwater from the release of sulfate and would reduce infiltration. Addition of main Beal waste rock as backfill material into South Beal pits could provide a new source of potentially acid generating material, but testing of backfill material before placement, segregating acid producing material and keeping the pit floor above the water table were expected to prevent negative impacts to water. The leach pad has a liner and effluent is controlled, resulting in only minor expected impacts from arsenic and metals. If pyrite oxidation occurs, waste would be segregated in order to isolate reactive waste and cap it. Addition of South Beal waste rock to the waste rock dump is not expected to produce acid or release contaminated leachate, but could provide neutral material for capping to help isolate potential leachable contaminants.

The LAD (land application discharge) system for disposal of excess leach solution demonstrated that all contaminant levels, including arsenic, are successfully attenuated prior to discharge. A cyanide destruction water treatment plan is used prior to LAD disposal. Addition of lime to waste rock will occur if necessary. Pit bottoms will be above the water table. Backfilling and capping were expected to prevent water accumulation in the pits. Pit floors composed of

marble bedrock were expected to reduce the potential for contaminant leaching. Any water that may accumulate in pits prior to backfilling would be used for irrigation on reclaimed portions of the waste rock facilities or other areas. The South Beal heap and waste rock area will be monitored to determine whether it will produce acid drainage.

Predicted impacts to groundwater from mining the South Beal Pits are expected to be minimal because the pits would be open for only one to two years. The water table under the pits is 25 to 50 ft below the estimated levels of the pit floors, so groundwater would not come in contact with backfilled waste from main Beal pit. If water infiltrates backfilled pits, sulfate could be produced and enter groundwater. Sulfate is expected to be released from South Beal ore, but the pH of the water is expected to remain neutral. Concentration of nitrate and sulfate released from the waste rock facilities may continue to increase with the addition of the South Beal waste. The potential that nitrate will discharge to groundwater downgradient of the pits into German Gulch was expected to be minimal due to the distance between the pits and the stream. Beal Mine was predicted to have both long- and short-term environmental effects in German Gulch; however, these effects were not predicted to be significant in terms of either areal extent or severity of impact. Results of leach tests (EPA Method 1310) indicated that metals mobility should be minimal. Open pit, waste rock dump and heap materials are not expected to cause acid drainage, either during operations or after mining. The heap is part of a zero discharge circuit and is not expected to release any water to the surface.

6.3.12.2. ACTUAL WATER QUALITY CONDITIONS

According to the 1993 EIS, elevated levels of sulfate were detected at the monitoring stations near the main Beal waste rock facility. Although the source has not been verified, it could be a precursor to acid drainage. Currently, sulfate concentrations in seeps emanating from below the main Beal waste rock dump are increasing. This could either be due to dissolution of gypsum incorporated in the rock, dissolution of soil amendments, application of a sulfate used for chemical dust abatement, or the oxidation of iron disulfides in mined material. Water quality in German Gulch has changed since baseline data were collected, showing that TDS, sulfate and nitrate concentrations have increased considerably. Currently, State Water Quality Standards (SWQS) are exceeded at some monitoring stations, demonstrating that existing Best Management Practices or mitigation measures are not effective. Nitrate concentrations have increased in groundwater in the vicinity of the main Beal project relative to background baseline conditions.

Existing Conditions Report

According to the February 2004 Existing Conditions Report (ECR), developed as part of the Engineering Evaluation /Cost Analysis (EE/CA) for this CERCLA site, surface water sampling results from German Gulch showed that concentrations of nitrate (MCL = 10 mg/l) and sulfate were less than 10 mg/l. Total recoverable concentrations of most metals and metalloids (including arsenic and copper) were below chronic aquatic life standards, while total recoverable iron concentrations in German Gulch did exceed secondary MCL values near the mine site. Selenium concentrations were well below the chronic aquatic life standard of 0.005 mg/l. The total concentration of cyanide in German Gulch was 0.008 mg/l, slightly higher than the chronic standard of 0.0052 mg/l. Total recoverable concentrations of copper were below the chronic aquatic standard at all stations in German Gulch in 2003. Selenium concentrations measured in December 2003 were 0.011 mg/l.

Groundwater quality monitoring well data indicated that groundwater in the LAD area exceeded standards for nitrate, iron and cyanide and had elevated total dissolved solids concentrations. Cyanide was not detected in the LAD area groundwater prior to 2001 when the LAD was initiated. Springs below the LAD area also showed appreciable increases in cyanide and selenium concentrations. Concentrations of selenium, sulfate, nitrate and total dissolved solids were elevated in seeps sampled at the toe of the waste rock dump.

Geochemical data from both static and kinetic tests indicated that roughly one-third of the waste rock and ore mined from the Beal Pit is potentially acid generating, one third is not and the remaining one-third has uncertain potential to generate acid. Geochemical characterization test results from South Beal pit ore and waste rock suggested a low potential for acid drainage from the pit highwalls and waste rock, and a high potential from residual ore. However,

the relatively small amount of residual ore is not expected to generate enough acidity to overwhelm the neutralization potential of the surrounding rock.

Static testing of spent ore indicated a high potential for acid generation; however, kinetic tests indicated a low potential for acid generation. Alkalinity and pH values have decreased somewhat following cessation of leaching operations, indicating that the neutralizing capability of the heap is slowly being depleted. Selenium and copper concentrations in the pad appear to be declining.

Water emanating from the toe drain collection system is pumped to a storage pond and has elevated selenium, sulfate and nitrate concentrations and cannot be discharged directly to surface water or groundwater without treatment.

Current leach pad water quality has elevated concentrations of sulfate (2,600 mg/l), selenium (0.38 mg/l), arsenic (0.16 mg/l), iron (4.0 mg/l, copper (0.42 mg/l), total cyanide (9.5 mg/l) and WAD cyanide (0.061 mg/l) Alkalinity values have decreased to about 100 mg/l ($CaCO_3$ equivalent).

6.3.12.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.17 provides a summary and comparison of potential, predicted and actual water quality information for the Beal Mountain Mine. The accuracy of the predictions is discussed in this section.

Increases in/Exceedences of Cyanide, TDS, Sulfate and Nitrate Concentrations in Surface Water: The 1988 EA predicted that the low sulfide content, high buffering capability and low metals concentrations would prevent degradation of water from the waste rock dump. The 1988 EA also indicated that there was only a minor potential for acid drainage from leach pad and waste rock material, and water quality was not predicted to be impacted. However, the increased sulfate concentrations may be a precursor to acid drainage. The 1988 EA predicted only a minor impact from residual cyanide from the leaching process. The leach pad liner system was expected to mitigate the potential for cyanide contamination, but it did not. The 1993 EIS indicated some potential for acid drainage from leach pad material and waste rock, but results of short-term leach tests indicated that metals mobility would be minimal. Therefore, predictions made in the new project EA and the 1993 EIS noted some potential for acid drainage and increased sulfate concentrations and underestimated the potential for contamination of surface water from the leach pad and waste rock.

Exceedences of Nitrate, Cyanide, and Iron Concentrations in Groundwater: As noted above, the leach pad liner system was expected to mitigate the potential for cyanide contamination. The open pit, waste rock dump, and heap were not predicted to cause acid drainage during operations or after mining, but the 1993 EIS did indicate some potential for acid drainage from leach pad and waste rock material. Therefore, predictions made in the new project EA and the 1993 EIS noted some potential for acid drainage, underestimated the potential for metals leaching and underestimated the potential for contamination of groundwater from the leach pad and waste rock.

Table 6.17. Beal Mountain, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Leached Ore	• 1988 EA: Impact from residual cyanide from the leaching process was predicted to be minor and probably undetectable • 1993 EIS: South Beal ore in leach pad could be acid generating but expected to remain neutral	• 1988 EA: solution ponds equipped with sump, leak detection • 1988 EA: leach pad rinsed to address residual cyanide followed by natural degradation, dilution and "mobilization." • 1993 EIS: effluent treated for cyanide and disposed by LAD	• 1988 EA: Water quality impacts from the leach pad would be minor and probably unpredictable • 1993 EIS: only minor impacts from As via LAD 1993 EIS: Heap is part of a zero discharge circuit and would not release any water to the surface.	• 2004 ECR: LAD of leach pad leachate following water treatment resulted in contamination of groundwater exceeding standards for nitrate, iron, cyanide. Accidence of cyanide concentrations in surface water
	Waste Rock	• 1988 EA: Low acid drainage and metals potential suggests that degradation of water will not occur from the waste rock dump • 1993 EIS: some potential for acid drainage and release of sulfates and metals to water resources	• 1988 EA: No mitigation identified • 1993 EIS: reclamation would minimize any potential for impacts to groundwater from the release of sulfates and reduce infiltration • 1993 EIS: segregation and blending of PAG waste rock with lime added if necessary	• 1988 EA: No impacts predicted • 1993 EIS: Concentration of NO_3 and SO_4 releases from waste rock facilities may continue to increase	• 1993 EIS: Increased SO_4 concentrations in waste rock toe seeps - possible precursor to acid drainage. Increases in TDS, SO_4, NO_3 in German Gulch relative to baseline data. • 2004 ECR: elevated Se, sulfate, nitrate and TDS in seeps below waste rock
Pit Water	Open Pit	• 1988 EA: Mine pit water expected to contain elevated ammonia and nitrate/ nitrite from blasting.	• 1988 EA: Diversion of stormwater and pit water for process use • 1988 EA: pit backfilled, lined with limestone and gravels, free-draining; rock in pit would neutralize contaminants	• 1988 EA: No pit water predicted • 1993 EIS: Predicted impacts would have little if any effect on groundwater.	2004 ECR: water from the open pit toe drains has elevated selenium, sulfate and nitrate and requires capture and treatment

6.3.13. BLACK PINE, MONTANA

The Black Pine Mine, owned by ASARCO, was in operation from 1974 to 1989 but was closed at various points during this period. The primary commodities mined were gold, silver and copper from underground mining, using flotation and gravity processing methods. The ore has also been mined as a silica flux for ASARCO's East Helena Smelter. It disturbs 429 acres on the Deerlodge National Forest in U.S. Forest Service Region 1 and has a current financial assurance amount of $8.07 million.

6.3.13.1. WATER QUALITY PREDICTIONS SUMMARY

The Deerlodge National Forest and Montana Department of Environmental Quality (formerly Department of State Lands) were the lead agencies for NEPA and MEPA actions at the Black Pine Mine. NEPA was required for mine re-opening after an extended closure period, and an EA in the form of a Preliminary Environmental Review (PER) was

completed in 1981. In 2003 an EA was conducted for short-term reclamation due to the existence of water quality issues. In 2004 another EA was conducted to address long-term reclamation. The NPDES permit was not required or part of the NEPA/MEPA action for the original operations, which were supposed to be zero discharge. The following sections summarize pertinent information in the NEPA documents reviewed.

1981 Preliminary Environmental Review

The primary minerals identified were sulfides and sulfosalts including hubnerite, tetrahedrite, pyrite and galena. Secondary mineral association consists of malachite, pyromorphite, oxidized lead, antimony and native silver. No geochemical characterization testing was performed, so the potential for acid drainage or leaching of contaminants was not identified in the PER. The amount of seepage from the tailings impoundment to groundwater was predicted to be low (14.6 gpm), and constituents reporting to the tailings impoundment were considered to be of low concentrations and degradable. Impacts to groundwater from tailings were predicted to be minimal. According to the PER, impacts to surface water systems in the project area will be minimal. No planned discharge to surface waters will occur. The tailings impoundment was designed as a closed cycle system.

2003 EA

According to the 2003 EA, the waste rock dump contains primarily quartzites and argillites of the Spokane Formation and ore vein material. Pyrite, iron staining and copper-bearing minerals can be seen on the surface of the dump, and copper staining from mobilization of copper minerals can be seen on rocks, bones and other debris on the surface of the dump. No sampling of the waste rock dump for geochemical characterization was performed. However, constituents of concern identified from existing waste rock dump seepage included sulfate, copper, zinc, iron, cadmium and low pH.

Mitigation identified in the EA included relocation and improvements to the seepage collection systems below the waste rock dump, consolidation/placement of contaminated materials on top of the waste rock dump and regrading the waste rock dump from angle of repose to a 3:1 slope.

2004 EA

No additional geochemical characterization information or water quality predictions were performed for this EA. The EA addressed final reclamation by requiring reclamation of the waste rock dump with a composite engineered cover consisting of a six 12-inch, low-permeability layer overlain by a drainage layer (sandy gravel) and then a soil cover (six inches of topsoil underlain by 18 inches of subsoil). Additional areas of contaminated soil would also be addressed.

The EA included a contingency to require more permanent long-term water management measures if the proposed reclamation measures are not effective, and the current bond assumes those measures will be necessary. The water treatment would most likely involve capture, pumpback, treatment and disposal.

6.3.13.2. ACTUAL WATER QUALITY CONDITIONS

The 2003 EA was initiated to reduce on-going water quality impacts caused by leachate from the waste rock dump, and it discusses these impacts. In 2000 MDEQ identified acid drainage and metals in springs on site with elevated levels of sulfate, metals and low pH. The 2003 EA showed waste rock was discharging acid drainage and metals to underlying groundwater and springs. Seepage collection and reclamation of the waste rock dump was performed to mitigate acid drainage. The leachate runs overland and off site and has killed vegetation in the area of the flows. Several ephemeral springs and one perennial spring issuing from the waste rock dump are contaminated by the dumps and are acidic (2.6 to 4.7) and high in sulfate, copper, zinc, iron and cadmium. The springs drain into groundwater and ephemeral drainages that flow into Smart Creek.

6.3.13.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.18 provides a summary and comparison of potential, predicted and actual water quality information for the Black Pine Mine. The accuracy of the predictions is discussed in this section.

Impact of Acid Drainage from Waste Rock Dump on Springs, Groundwater, and Ephemeral Drainages: No geochemical testing was performed on waste rock in any of the environmental reports. Information on geology and mineralization gave some hint of the potential for acid drainage (sulfides in quartzites with carbonates on site, but not in ore body), but this information was not evaluated or used as a basis for ordering geochemical testing. The only identified source of potential water contamination in the 1981 PER was the tailings impoundment. The 1981 PER indicated no potential for acid drainage or contaminants with no planned discharge to surface water and predicted minimal impacts to water resources. The 2004 EA indicated long-term potential for acid drainage and metals from the waste rock dump and underground workings. Therefore, the observed water quality impacts to springs, groundwater and surface drainages were not predicted. No geochemical testing on waste rock was performed, and the mineralization, although suggestive of potential acid generation, was not further investigated. The only identified potential source of water contamination, the tailings impoundment, has not yet been shown to be impacting groundwater.

Table 6.18. Black Pine, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Waste Rock	• 1981 EA: no potential for acid drainage or leaching of contaminants was identified • 2003 EA: existing leachate from the waste rock dump contaminating groundwater and springs on site with acid drainage and metals. • 2004 EA: long-term leachate from the waste rock dump and potential water quality problems from underground mine workings	• 1981 EA: No planned discharge to surface waters will occur • 2003 EA: relocation and improvements to the seepage collection systems below the waste rock dump; consolidation /placement of contaminated materials on top of the waste rock dump; and regrading the waste rock dump from angle of repose to a 3:1 slope. • 2004 EA: reclamation of the waste rock dump with a composite engineered cover; contingency to require more permanent long-term water management measures if the proposed reclamation measures are not effective o capture, pumpback, treatment and disposal.	• 1981 EA: impacts to surface water systems in the project area will be minimal • 2003 EA: reduction of existing water quality impacts is expected • 2004EA: long-term reduction and prevention of future water quality impacts is expected	2000 DEQ: identified existing leachate from the waste rock dump contaminating springs on site showed elevated levels of sulfates, copper, zinc, iron, cadmium, and low pH (2.6 - 4.7).

6.3.14. GOLDEN SUNLIGHT, MONTANA

The Golden Sunlight Mine, owned by Placer Dome, Inc., has been in operation since 1983. The primary commodities mined are gold and silver from open pit and some limited underground mining, using cyanide vat leach and gravity processing methods. It disturbs 2,967 acres on private, state and BLM lands. It has a current financial assurance amount of $64.1 million.

6.3.14.1. WATER QUALITY PREDICTIONS SUMMARY

The Bureau of Land Management and Montana Department of Environmental Quality (formerly Department of State Lands) were the lead agencies for NEPA and MEPA actions at the Golden Sunlight mine. NEPA and MEPA were required for the new project to be permitted, and an EIS was completed in 1981. A subsequent EA for expansion was conducted in 1990, followed by an additional EIS for mine expansion in 1997. Currently an additional EIS is being developed for consideration of open pit backfilling. The following section summarizes the pertinent information in the NEPA documents reviewed.

1981 EIS

Only ABA tests were performed. No constituents of concern were identified. Results of testing confirmed the potential for the ore to produce acid. According to the EIS, the potential for acid mine drainage from the proposed project was considered to be minimal, based on the previous, historic mining activity and waste dump development on the project site that had not resulted in acid mine drainage. There was also a general lack of a water discharge from existing underground workings at the mine.

The EIS addressed the potential for groundwater contamination from tailings leachate, which contained cyanide. Mitigation identified in the EIS included the use of finger drains, a clay liner, cutoff trench and the impervious nature of the underlying sediments. Seepage would be collected in ditches and pumped back to the impoundment. Normal operation of the proposed facilities would not result in a significant adverse impact to the areas existing subsurface and surface water resources. The risk to groundwater after mitigation was predicted to be low. The design approach was projected to achieve a zero discharge facility. The infiltration of mining-impacted water to the groundwater system was predicted to be very localized and not cause any measurable change in groundwater quality.

1990 EA

The EA identified sulfide mineralization, with waste rock containing 1 to 5 % sulfides, of which 99 % was pyrite with minor amounts of chalcocite, chalcopyrite, bornite, galena, sphalerite and barite. Oxidation of waste rock was expected to be generally limited to within 100 ft of the surface. ABA, EP Toxicity, total sulfur and sulfur fractionation, and "laboratory weathering" geochemical characterization tests were performed. Constituents of concern identified included low pH, elevated levels of metals, nitrate and high salt concentrations.

According to the EA, the pH value for waste rock averaged 4.2 (acid generating). All laboratory weathering samples of waste rock produced acid. All samples of unoxidized mudrock near the breccia ore body produced acid in the laboratory weathering tests. All samples of oxidized mudrock also produced acid in the laboratory weathering tests. If reclamation does not eliminate available oxygen and water, the tailings are predicted to eventually acidify. Waste rock piles are also predicted to eventually acidify from oxygen convection due to the high sulfide content and lack of a waste rock cap. Ultimate water quality in the mine pit is uncertain, but leachate analysis suggests the water would have low pH and elevated levels of metals, nitrate and salts in excess of the natural groundwater conditions. The EA suggested that water seeping from the pit would be modified by "a variety of unidentifiable geochemical processes," and this flow would reduce the quality of the receiving water and exceed water quality standards.

According to the EA, engineered mitigation would consist of an impoundment designed with an amended soil liner and a piping system above the liner to carry tailing seepage through the embankment face to a collection system and

the mill circuit. The slurry wall would intercept the majority of seepage from the impoundment. It is anticipated that seepage to the east and south of the impoundment may occur. In time, a decrease in the effectiveness of the plumbing system for the impoundment is expected. This decrease in efficiency may result in a rise of phreatic levels within the impoundment and drainage through the impoundment bottom or through the embankment face.

To meet the requirements of the Montana Metal Mine Reclamation Act (MMRA), GSM committed to treat any discharge from the mine pit, waste rock dumps and tailings impoundments. The 1990 EA states that "Treatment in perpetuity has never been addressed by the regulatory agencies."[3] In addition, a mass balance model was used to justify the recommendation for a two-ft waste rock and two-ft soil cap cover to minimize infiltration and leachate quantities.

1998 EIS

The 1998 EIS resulted from citizen lawsuits that appealed the 1990 EA decision. This EA found that there would be no significant impacts, even though the high potential for acid drainage and substantial reclamation and water treatment requirements were identified..

The EIS identified high potential for acid drainage and contaminant leaching. The potential contaminants list was increased in the 1998 EIS to include aluminum, arsenic, cadmium, copper, zinc, pH, sulfate, chromium, iron, lead, manganese, nickel and selenium. Contaminants typically exceeded drinking water standards by 10 times or more in waste rock pore water extracts. Groundwater contamination was predicted to occur in tens to hundreds of years. Pit water, if allowed to form, was similarly expected to be characteristic of acid drainage. The tailings impoundments were also expected to become acid generating over the long-term.

The 1998 EIS acknowledged the presence of acid drainage-like solutions from springs in the project area, containing elevated concentrations of sulfate and trace metals. These springs were considered natural because of the abundant ferricrete associated with them, suggesting that acid drainage has been produced by Bull Mountain for some time. However, it is possible that mining activity caused the elevated concentrations, and no baseline water quality data are available to determine the cause or causes of the elevated concentrations.

An acid drainage transport model was used to estimate the potential for contamination from the waste rock dumps to affect surface water in the Jefferson River. HELP modeling was used to estimate precipitation inflow rates into the waste rock dumps. A mixing cell model was used to predict interaction of leachate with the groundwater flow system and eventual transport to surface water. Dump seepage was predicted to reach the water table within 30 to100 years, followed by a period of approximately 2,000 years where seepage was primarily characterized by high sulfate levels, followed by a steep increase in acidity and metals contamination beginning in approximately 3,000 years and extending for up to 10,000 years in the future. Best case results suggested the most significant impacts would not occur for up to 5,000 years in the future, while worst case results suggested the same impacts would occur approximately 600 years in the future.

In addition to an engineered cover (2 ft non acid-generating material and 2 ft soil) and perpetual waste rock seepage water treatment, mitigation included installation of drains and other seepage capture devices to reduce the amount of acid drainage that reaches groundwater.

The tailings impoundments were expected, over the short-term, to continue to leak cyanide-containing solutions into groundwater and to require pumpback systems to mitigate the groundwater plume and prevent it from reaching surface water. The No. 1 tailings impoundment was expected to continue leaking until it is effectively reclaimed, and localized leaks were expected to occur from the No. 2 tailings impoundment over the long-term. After closure the leachate was expected to become acidic. However, the EIS predicted that an engineered cover (2 ft NAG and 2 ft

[3] It appears that this may be the first regulatory reference in the U.S. dealing with hardrock mine sites that acknowledges the possibility of perpetual treatment as a potential scenario.

soil) would decrease leachate infiltration to groundwater and little or no impact to groundwater would occur. Present day tailings impoundment plume mitigation included groundwater pumpback systems, slurry walls and landowner buyouts as well as replacement water provisions.

No pit pond would be allowed to form if it exceeds Montana surface water quality standards. Pit water treatment would be required if necessary for discharge.

2005 EIS

In 2002 another citizens' lawsuit resulted in a requirement for the Golden Sunlight Mine to prepare an EIS to address pit backfilling, which the court ruled the mine was required to do in order to meet the State's constitutional requirements. The Draft EIS was issued in 2005. It contains an analysis of the potential for backfilling of the open pit to impact groundwater and surface water quality and will most likely include predictions for both backfilling and non-backfilling as well as pit lake scenarios.

6.3.14.2. ACTUAL WATER QUALITY CONDITIONS

According to the 1998 EIS, monitoring of existing waste rock dumps showed sulfide oxidation and potential for acid drainage, with some piles already producing acid drainage. Evidence shows some springs on the project site were impacted, but larger impacts to groundwater or surface water from the waste rock dumps have not been evident to date.

The primary source of existing groundwater contamination at Golden Sunlight is the tailings impoundment. The groundwater contains cyanide and copper concentrations above standards and has required numerous mitigation, as described in the previous section.

6.3.14.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.19 provides a summary and comparison of potential, predicted and actual water quality information for the Golden Sunlight Mine. The accuracy of the predictions is discussed in this section.

Groundwater Contamination from Tailings Impoundment: Potential groundwater contamination with cyanide and metals from the tailings impoundment was identified in the 1983 EIS, but mitigation (clay liner, finger drains, leachate collection) were predicted to prevent any impacts to groundwater. The 1990 EA stated that capture of the tailings plume would prevent more extensive groundwater contamination, but capture was not entirely effective. Therefore, the estimated potential (pre-mitigation) impacts of cyanide and metals from the tailings impoundment were accurate. The predictions that the tailings impoundment mitigation would prevent groundwater contamination and that plume capture would limit further groundwater impact were not accurate.

Acid Drainage in Waste Rock Pore Fluids, Pit Water, and Springs Downgradient of Waste Rock Dumps: Geochemical characterization conducted for the 1981 EIS identified the potential for acid drainage, but because historic operations had not resulted in acid drainage, the potential was considered to be low. In addition, the acid-base accounting results were accompanied by a statement from the laboratory that laboratory results were not representative of field conditions (due to grinding of sample), and that acid drainage generation could be less important than indicated by the test results. Therefore, acid-base accounting tests did predict the acid drainage that ultimately developed at the site, but the prediction that acid drainage would not develop based on information from historic operations was not accurate.

Table 6.19. Golden Sunlight, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings	• 1981 EIS: Geochemical tests indicate acid drainage potential but site indications used to suggest low actual potential. • 1981 EIS: Potential for contamination of groundwater from tailings solution containing cyanide. • 1990 EA: Potential for acid drainage and metals in leachate • 1998 EIS: Short-term tailings leak containing cyanide and other contaminants expected to continue • 1998 EIS: Long-term potential for tailings to go acid	• 1981 EIS: Facility design to prevent groundwater and surface water impacts. ○ use of finger drains ○ clay liner ○ cutoff trench ○ impervious nature of the underlying sediments • 1990 EA: Capture of contaminated groundwater ○ Slurry walls and downgradient wells • 1998 EIS: Capture of contaminated groundwater ○ Slurry walls and downgradient wells ○ landowner buyouts ○ replacement water provisions ○ perpetual treatment of tailings seepage • 1998 EIS: Reclamation cover to decrease long-term potential for impacts from acid drainage	• 1981 EIS: Risk to groundwater "slight" • 1990 EA: Prevent contamination from becoming more extensive in groundwater and will protect surface water • 1998 EIS: Little or no long-term impact to groundwater from acid drainage. No impacts to groundwater outside of existing cyanide plume.	• 1990 EA: Contamination of cyanide and copper in downgradient wells • 1998 EIS: Continued contamination of cyanide and copper in dowgradient wells • Water Quality Monitoring: Capture not 100% efficient due to operational problems

Table 6.19. Golden Sunlight, MT, Potential, Predicted and Actual Impacts (continued).

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Waste Rock	• 1981 EIS: Geochemical tests indicate acid drainage potential but site indications used to suggest low actual potential • 1990 EA: Significant potential for acid drainage and metals in waste rock leachate • 1998 EIS: Significant potential for impacts from acid drainage and metals over long-term	• 1981 EIS: No mitigation identified as needed • 1990 EA: Capture of contaminated groundwater ○ Slurry walls and downgradient wells • 1990 EA: Engineered covers to reduce leachate production • 1998 EIS: Capture of contaminated groundwater ○ Slurry walls and downgradient wells ○ installation of drains and other seepage capture devices • 1998 EIS: Reclamation cover to decrease long-term potential for impacts from acid drainage	• 1981 EIS: Risk from acid drainage "minimal" • 1990 EA: Mitigation to prevent significant long-term impacts from acid drainage • 1998 EIS: Mitigation to prevent significant long-term impacts from acid drainage in surface water. No impacts to groundwater outside of proposed mixing zone.	Water Quality Monitoring: No actual impacts noted to date although springs near east waste rock dump and pore water in all waste rock dumps indicate long-term acid drainage and metals leaching impacts
Groundwater, Surface Water and Pit Water	Open Pit	• 1983 EIS: Pit not expected to go below groundwater level • 1990 EA: Significant potential for acid drainage and metals in leachate from open pit • 1998 EIS: Pit water expected to be characteristic of acid drainage	• 1983 EIS: No mitigation identified as needed • 1990 EA: Capture of contaminated pit water • 1998 EIS: Capture and treatment – no pit lake allowed to form	• 1983 EIS: no impacts to water quality • 1990 EA: Mitigation to prevent significant long-term impacts from acid drainage • 1998 EIS: Mitigation to prevent significant off-site impacts from acid drainage	Water Quality Monitoring: Monitoring of pit water indicates acid drainage characteristics

6.3.15. MINERAL HILL, MONTANA

The Mineral Hill Mine (also known as the Jardine Joint Venture), owned by TVX Gold Inc., was in operation from 1989 to1996. The primary commodities mined were gold and silver from an underground mine that used cyanide vat leach processing methods. It disturbs 106 acres on private and Gallatin National Forest lands in U.S. Forest Service Region 1. It has a current financial assurance amount of $8.5 million.

6.3.15.1. WATER QUALITY PREDICTIONS SUMMARY

The Gallatin National Forest and Montana Department of Environmental Quality (formerly Department of State Lands) were the lead agencies for NEPA and MEPA actions at the Mineral Hill Mine. NEPA and the Montana Environmental Policy Act (MEPA), which closely mirrors the federal law, were required for the new project to be permitted, and an EIS was completed in 1986. A subsequent EIS for reclamation and closure was conducted in 2001. The following sections summarize the pertinent information on water quality from the NEPA documents reviewed.

1986 EIS

According to the 1986 EIS, minerals in the gold-bearing zone included arsenopyrite, pyrrhotite, pyrite, chlorite, quartz and amorphous carbon. Metamorphosed marine sediments host the gold ore. Geochemical characterization testing consisted of a batch extraction leach test on the tailings material. The leachate the from batch extraction contained elevated cyanide as free cyanide, arsenic and manganese. Arsenic and cyanide contamination from old tailings on the site was also mentioned as affecting background water quality. Identified potential groundwater impacts (to Bear Creek alluvium) included direct seepage from the tailings dump and production of leachate in mine workings and backfill.

The lack of water in the workings (location above the water table) were expected to limit the potential for acid drainage. Removal and reprocessing of old, existing tailings piles was proposed to address historic tailings impacts on water quality at the site. Tailings from current mining would not be dewatered before backfilling; however, slurry would be controlled by ditches in the mine, collected in underground sumps and pumped back to the mill circuit. Tailings disposed on surface would be dewatered and placed in a lined repository.

2001 EIS

According to the EIS, mining operations ceased before the originally anticipated life-of-mine. Changes in proposed reclamation techniques and water management practices prompted the EIS.

The tailings facility design resulted in unanticipated lateral flow that escaped the liner system, resulting in contamination of alluvial groundwater and surface water. The seepage contains cyanide, nitrate, manganese, sulfate, arsenic and TDS. The proposed mitigation for the discharge would involve capture and treatment of the leachate with discharge to the vadose zone for evapotranspiration and the use of a 48-inch thick water balance cover to reduce seepage.

Modern mining operations impacted the historic flow from the mine, which was less than a few gallons per minute (gpm), resulting in an increased flow of approximately 15 gpm with arsenic concentrations in excess of standards. The proposed mitigation for the impacts would involve treating the 15 gpm flow to reduce arsenic to acceptable levels and discharging to groundwater (versus present discharge to surface water).

Proposed long-term mitigation included replacement of the water treatment system and long-term monitoring and maintenance for 100 years; financial assurance insured those operations.

6.3.15.2. ACTUAL WATER QUALITY CONDITIONS

Groundwater and surface water was contaminated by tailings leachate, which contained cyanide, nitrate, sulfate, TDS, manganese and arsenic. Increased flow from the mine adit contains arsenic in excess of the mine's NPDES discharge standards.

6.3.15.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.20 provides a summary and comparison of potential, predicted and actual water quality information for the Mineral Hill mine. The accuracy of the predictions is discussed in this section.

Table 6.20. Mineral Hill, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings	• 1986 EIS: potential for elevated cyanide, arsenic and manganese in tailings leachate to contaminate groundwater • 2001 EIS: potential for cyanide, arsenic, manganese, sulfate, nitrates and TDS in tailings leachate to contaminate alluvial aquifer and surface water	• 1986 EIS: Tailings dewatered and placed in a lined repository • 2001 EIS: capture and treatment of the leachate with discharge to the vadose zone; water balance cover to reduce seepage	• 1986 EIS: no surface water impacts predicted • 2001 EIS: no impacts predicted as long as mitigation is maintained (100 years)	2001 EIS: tailings leachate containing cyanide, nitrate, manganese, sulfate, arsenic and TDS escaped the liner system and caused exceedences in alluvial groundwater and surface water
	Underground Workings	• 1986 EIS: potential for acid drainage from mine workings or backfill to contaminate alluvial aquifer • 2001 EIS: no information	• 1986 EIS: none • 2001 EIS: water treatment to reduce arsenic to acceptable levels and discharge to groundwater	• 1986: no impacts predicted • 2001 EIS: no impacts predicted as long as mitigation is maintained (100 years)	• 2001 EIS: flow from mine workings of approximately 15 gpm that contained arsenic in excess of standards

Contamination of Alluvial Groundwater and Surface Water by Tailings Seepage: Geochemical characterization (batch leach test) conducted for the 1986 EIS identified the potential for elevated concentrations of cyanide, arsenic and manganese in tailings leachate. Tailings were dewatered and placed in a lined repository, and no impacts to water resources were predicted in the 1986 EIS after mitigation were in place. The potential for seepage of tailings leachate to groundwater was identified in the 1986 EIS. The 2001 EIS identified the potential for alluvial groundwater and surface water contamination with cyanide, arsenic and manganese (as identified in 1986), as well as sulfate, nitrate and TDS (not predicted as contaminants of concern in the 1986 EIS). The liner system in the tailings impoundment failed to prevent lateral flow of leachate. Therefore, geochemical characterization did predict the observed increases in three of six constituents in tailings leachate, but post-mitigation predictions were inaccurate because the mitigation were not able to prevent impacts to groundwater and surface water resources.

Increased Volume and Exceedence of Arsenic Standard in Adit Drainage: The potential for leakage from mine workings to Bear Creek alluvium was identified in the 1986 EIS, but the mine was not expected to produce appreciable amounts of water, so no impacts were predicted. Increased flow (compared to historic mining flows) from the underground mine (15 gpm) contained enough arsenic that treatment is required prior to discharge. Arsenic was noted in tailings leachate from the batch extraction tests, but no tests were conducted on mine workings walls. Acid

drainage, which was predicted as being a potential issue in 1986, has not been an issue so far. Therefore, the hydrologic prediction that there would not be much water in the underground workings was not accurate. Arsenic was not identified as a constituent of concern in mine drainage, in part because no geochemical characterization tests were conducted on waste rock or ore.

6.3.16. STILLWATER, MONTANA

The Stillwater Mine, owned by Stillwater Mining Company, has been in operation since 1986. The primary commodities mined are platinum group minerals from underground mining, using flotation processing methods. It disturbs 255 acres on private and Custer National Forest lands in U.S. Forest Service Region 1. It has a current financial assurance amount of $7.8 million.

6.3.16.1. WATER QUALITY PREDICTIONS SUMMARY

The Custer National Forest and Montana Department of Environmental Quality (formerly Department of State Lands) were the lead agencies for NEPA and MEPA actions at the Stillwater Mine. NEPA was required for the new project to be permitted, and an EIS was completed in 1985. In 1992 an EIS was conducted for a mine expansion and in 1998 an EIS was conducted for a new tailings disposal facility and revised waste management. The following sections summarize the pertinent water quality information in the NEPA documents reviewed.

1985 EIS

According to the 1985 EIS, the original intrusion contained iron, nickel, chromium, copper and platinum-group (sulfide) minerals. Other nickel-copper-chromium deposits are located in the local area. No information is contained in the EIS on geochemical characterization testing or water quality impact potential. The only constituent of concern identified was nitrogen. Mitigation would include lining of the tailings impoundment with 36-mil hypalon synthetic liner to prevent seepage from reaching the Stillwater River. Only nitrogen compounds were expected to affect groundwater quality. Even under most severe conditions (high flow and high nitrate concentrations in pond seepage and low flow and high nitrate concentrations in river) excess algal growth in the river was not expected to occur. Additional nitrogen compounds would not influence algae growth because of the low phosphorous concentrations in the river. Stillwater River was not predicted to be influenced by seepage from dewatering of the underground workings.

1992 EIS

Geochemical characterization consisted of static testing of ore and waste materials. The EIS proposed to do static and if necessary kinetic testing to identify potential for acid production and metals leaching. Constituents of concern identified in ore included lead, cadmium, mercury and zinc, iron, copper, nickel, TDS, sulfate, nitrate, chromium, ammonia and nitrate. Mitigation included lining of the tailings impoundment, reclamation to include a structural cap of waste rock, and reduction in the use of nitrogen-containing explosives. The operation is a zero-discharge facility except for underground workings dewatering discharges, which are percolated to groundwater (land application discharge or LAD).

1998 EIS

According to the 1998 EIS, acid-base accounting, Toxicity Characteristic Leaching Procedure (TCLP), Sequential Saturated Rolling Extraction, and column leach extraction tests were performed, and the HELP model was used to estimate infiltration into waste rock and tailings. ABA test results showed low potential for the waste rock to generate acid.

According to the EIS, the primary mitigation for the new tailings impoundment were an HDPE and clay liner with an seepage collection system and treatment of water from underground workings for nitrogen using denitrification with an anoxic biotreatment cell.

Seepage from the unlined storage pond was predicted to have no significant impact on groundwater quality because of the low permeability of underlying glacial material (project less than 2 gpm seepage). Groundwater in the area is not expected to be impacted. Modeling predicted nitrate concentrations in the Stillwater River from Hertzler LAD water to be 0.70 mg/l, but concentrations are expected to be much lower due to uptake by vegetation, evaporation and high flow in the Stillwater River. Alluvial waters along the Stillwater River are not predicted to be affected, as the Hertzler Tailings Impoundment and LAD are more than one mile from the river.

6.3.16.2. ACTUAL WATER QUALITY CONDITIONS

The 1992 EIS stated that chromium, zinc and to a lesser extent, cadmium, were elevated in well downgradient of the LAD relative to upgradient wells. Increased TDS, sulfate, nitrate and to a lesser extent, chromium and zinc, were thought to reflect the disposal of excess adit water through land application and percolation. According to the 1998 EIS, water discharged from the West Side Adit and East Side Adit between March 1990 and June 1997 exceeded standards (either Montana human life or aquatic standards) for dissolved cadmium, copper, manganese, zinc and total recoverable cadmium, copper and lead. Nitrogen in adit discharge water was much higher than baseline levels. Dissolved chromium regularly exceeded human health standards at all groundwater monitoring sites in the LAD area, and there were slight elevations of sulfate, chloride, phosphorous, cadmium, iron, and zinc observed downgradient of the LAD area.

The Stillwater Mine has been collecting surface water and groundwater quality data since 1980 to document the water quality to prior the development of the mine and during on-going mine operations. In 2003, a comprehensive Baseline Water Quality Study (CSP2, 2003) was completed examining the baseline water quality from before mining to present. The results of the study showed that over the approximately 18 years of mine life no noticeable impacts (compliance with Montana non-degradation water quality standards) to water quality in the Stillwater River have occurred due to the operation of the Stillwater Mine. There were no discernable impacts with the exception of increased nitrogen concentrations, which are from mining operations. The increase in concentration averages approximately 0.2 mg/l over the life of the mine with seasonal fluctuations ranging from less than 0.1 mg/l to as high as 0.7 mg/l (the regulatory limit in SMC's MPDES permit is 1.0 mg/l). Stillwater Mining, as part of to Good Neighbor Agreement with local conservation organizations, has agreed to optimize its water treatment and land application discharge operations and remove 90% more nitrogen than is required by its NPDES permit and reduce maximum concentration increases in groundwater to 2.0 mg/l and in the Stillwater River to 0.2 mg/l.

6.3.16.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.21 provides a summary and comparison of potential, predicted and actual water quality information for the Stillwater Mine. The accuracy of the predictions is discussed in this section.

Elevated Concentrations of Nitrate, Metals and Anions in Adit Discharge and Groundwater in the LAD Area:. The 1985 EIS did not include geochemical characterization but did indicate the potential for increased nitrogen concentrations. The 1992 EIS identified lead, cadmium, mercury, zinc, iron, copper, nickel, chromium, TDS, sulfate and nitrogen in ore and waste materials as constituents of concern. The 1992 EIS also noted that increased concentrations of chromium, zinc, cadmium and other constituents were present in groundwater in the LAD area. The 1998 EIS indicated no potential for groundwater impact from land application of adit discharge water, even though increased concentrations had been noted in the 1992 EIS. The 1998 EIS indicated that groundwater being discharged from the underground mine to percolation and LAD exceeded surface water standards for metals and nitrogen, and groundwater at the site had elevated levels of metals and sulfate. However, the 1998 EIS failed to identify that the most likely source for the metals and sulfate was historic tailings, and not current mine operations other than for nitrate. Therefore, many of the constituents with increased concentrations in groundwater in the LAD area had been

identified as constituents of concern, but the potential for impacts to groundwater from the LAD system was underestimated.

Table 6.21. Stillwater, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings and Waste Rock	• 1985 EIS; no potential for acid drainage or other contaminants except nitrogen • 1992 EIS; potential for Pb, Cd, Hg, Zn, Fe, Cu, Ni, Cr, TDS, Sulfate, nitrogen compounds • 1998 EIS: no potential for acid drainage or metals identified: potential for nitrogen identified	• 1985 EIS; line tailings impoundment • 1992 EIS; line tailings, cap waste rock, reduce explosives usage • 1998 EIS: line tailings impoundment	• 1985 EIS; nitrogen will increase in groundwater but no impacts to surface water quality • 1992 EIS; no impacts to water quality predicted 1998 EIS: no impacts to water quality predicted	1985 – 2004: No discernible impacts to surface water or groundwater other than nitrogen (below standards)
	Discharge Water from Underground Workings	1998 EIS: Water discharged from underground workings exceeds standards for Cd, Cu, Mn, Zn, Pb with high levels of nitrogen. LAD discharge contains elevated levels of Cr, SO_4, Cl, P, Cd, Fe, Zn	• 1998 EIS: water treatment to reduce nitrogen and land application discharge at agronomic rates for nitrogen uptake	• 1998 EIS: Groundwater quality not expected to be diminished and surface water would not be affected	• Adit water (1990 - 1997) exceeded Montana standards for Cd, Cu, Pb, Mn, Zn; N concentrations higher than baseline. Groundwater downgradient of LAD had regular exceedences of Cr and slight elevations of SO_4, Cl, P, Cd, Fe, Zn. • Increases in the Stillwater River of N, up to 0.7 mg/l (std = 1.0 mg/l).

Increases in Nitrate Concentrations Above Baseline Values in Stillwater River: A Baseline Water Quality Review which examined the groundwater and surface water quality at the mine found that no detectable impacts to surface water quality have occurred during the 20+ year mine life other than increases in nitrogen typically 80% below (90% below from 2000-2005) the narrative standard of 1.0 mg/l. The increased concentrations are related to mining activity. The potential for movement of nitrate toward the river was acknowledged, but, nitrate and ammonia concentrations from the LAD were not expected to affect the Stillwater River. Modeling predicted nitrate nitrogen concentrations from the LAD to be 0.70 mg/l or lower in the river, due to uptake by vegetation, evaporation and high flow in the Stillwater River. Therefore, the impacts of nitrate (above baseline values but below standards) to the Stillwater River were accurately predicted.

6.3.17. ZORTMAN AND LANDUSKY, MONTANA

The Zortman and Landusky mines (initially two separate mines), owned by Pegasus Gold Co., started operation in 1979. The operations were suspended in 1997, followed by company bankruptcy and mine closure in 1998. The primary commodities mined were gold and silver from numerous open pits using cyanide heap leach processing methods. It disturbs 1,215 acres on private and BLM lands. It had a financial assurance amount of $70.5 million when Pegasus went bankrupt.

6.3.17.1. WATER QUALITY PREDICTIONS SUMMARY

The Bureau of Land Management and the Montana Department of Environmental quality (formerly Department of State Lands) were the lead agencies for NEPA and MEPA actions at the Zortman and Landusky mines. NEPA and MEPA were required for the new project to be permitted, and an EIS was completed for both mines in 1979. In 1993 an EA for modified operating and reclamation was performed, and in 1996 an EIS for a major expansion of the Zortman Mine, along with modified reclamation plans for both mines, was performed. Subsequent to Pegasus's bankruptcy, a SEIS was conducted in 2001 to address reclamation and closure issues. The following sections summarize the water quality information in the NEPA documents reviewed.

1979 EIS

According to the EIS, oxidation (on both properties) generally persists to the levels of the deepest workings on the property, which are 500 ft bgs. No geochemical characterization tests were conducted, and the only constituents of concern identified were cyanide and cyanide complexes. The potential for a lining failure was acknowledged, in either the heap or process water pads, which would release an unknown amount of solution to the groundwater. In this case, the presence of significant amounts of heavy metal ions in the seepage would be of a potentially great concern. For surface water, the major concerns were identified as sedimentation and chemical contamination from potential leaks or overflows of leach pad or pregnant and barren ponds. However, no measurable cumulative impact was expected to surface water from either project after mitigation (berms, ditches and impermeable barriers) are in place. The potential for acid drainage development was expected to be low because only oxide ore would be mined.

Mitigation were directed towards potential cyanide leach solution leakage and stormwater management. A groundwater monitoring program was proposed, where any contaminated groundwater would be pumped and piped for containment and neutralization in either the barren pond or and emergency storage pond until the source of the leak is detected and repaired. However, because of the utilization of both membrane and clay liners, it was not anticipated that either operation would have a significant effect on groundwater quality during normal operations. The utilization of berms, ditches and impermeable barriers was expected to prevent deterioration of surface water from the waste ponds. A cumulative effect on the groundwater was predicted from infiltration from both pits. The impact, however, was expected to be small due to the small area proposed for mining. No water was expected to accumulate in pits because the pit floors were proposed to be sloped and graded to prevent the formation of ponds.

1990/91 EA

Static tests were conducted as part of the 1990 EA to assess the potential for acid rock drainage. The sample results showed some rock units had net acid generating potential and some units had net neutralizing potential. The study used the composite of all rock samples to conclude that widespread development of ARD was not likely. As mitigation, the operator's plan stated that any high sulfide waste rock would be placed on the leach pad instead of the waste rock dump. In 1993 BLM issued a noncompliance with ZMI for not following this mitigation and ordered waste rock disposal in the Mill Gulch waste rock dump to cease.

The main water quality issue in this EA was the post-closure retention of high cyanide concentrations in the spent ore. A cyanide degradation study was required as part of the EA. The study concluded that cyanide concentrations would rapidly degrade after leaching and that only minimal rinsing would be necessary. This study turned out to be correct

regarding cyanide levels, but did not address the high nitrate concentrations left in the heap effluent from the degradation of cyanide.

1993 EA

According to the EA, iron sulfides including pyrite, pyrrhotite and marcasite were identified in the ore. Geochemical characterization tests performed include paste pH, total sulfur, ABA, leachate extraction tests and long-term field-based leachate extractions. Constituents of concern identified included cadmium, fluoride, sulfate, zinc, low pH, nitrate and arsenic. Major ores being mined contained both oxide and sulfide rock.

The EA identified mitigation including properly engineered caps over reclaimed dumps and heap leach pads. Pump-back systems were proposed to reduce impacts to groundwater by collecting acidified water below Sullivan Park dike and routing it into the pump-back system. A water treatment plant was required to be constructed at the Zortman Mine to treat mine drainage from both mines. The treatment plant was brought online in 1994. Slurry cutoff walls below the dike were proposed to reduce the volume of acidic water bypassing the contingency pond. Perforation of the leach pad liners would be delayed until leach pad seepage meets water quality standards. Diversion structures were designed to withstand 6-inch, 100-year, 24-hour storm events. Leach pad underdrains will capture water that is pumped to the contingency pond and not discharged to surface waters but directed to the processing circuit.

1996 EIS

Geochemical characterization tests performed include total sulfur, paste pH, ABA, kinetic testing (both long term and short term) and humidity cell tests for ore and waste rock, and cyanide speciation analysis. The HELP model was used to predict infiltration rates. Constituents of concern identified included cyanides, sulfate, TDS, nitrate and metals. Static tests performed on Zortman and Landusky ores showed a strong potential to generate acid. For both mine sites, waste samples having negative NNP's were considered potentially acid generating. At Landusky, short-term increases in TDS, sulfate and metals concentrations were predicted to occur at Sullivan Creek, Mill Gulch and Montana Gulch due to the lack of diluting water, but the loads were expected to be reduced rapidly.

Mitigation identified included segregating acid-generating waste from non-acid generating waste and using a combination of "water barrier" and "water balance" reclamation covers. Most of the historic mine workings would be removed by extended mining of Zortman pits. Old adits would be bulkheaded where exposed in the pits to minimize oxygen flow and discharge of transient water. A water quality improvement plan would be implemented. Capture systems, cutoff walls and recovery wells would be used to intercept poor quality surface water. Existing waste rock dumps would be removed and used as backfill material for pits. The Zortman pit complex was proposed to be backfilled with waste rock to an elevation necessary to drain freely into Ruby Gulch and Alder Spur, thereby reducing the potential for groundwater discharge to the north. Water treatment of collected groundwater and surface water for cyanide, nitrate, acid drainage, metals and other constituents would be implemented as required. The EIS predicted that the volume of acid drainage that would need water treatment over the next 20 years would be between 211 and 419 gpm. In 2005 the Zortman and Landusky water treatment plants treated at an annualized average of 490 gpm.

2001 EIS

According to the 2001 supplemental EIS, iron and iron/arsenic sulfides are present in the igneous intrusion responsible for the orebody. Carbonates exist in the area, but not in the ore deposit itself. Additional geochemical characterization tests were performed including paste pH, paste TDS, and ABA. Constituents of concern identified included sulfate, low pH, iron, aluminum, zinc, arsenic, copper, cadmium, cyanide and nitrate. It is expected that eventually most sources at the site (leach pads, waste rock, pits) have significant potential to generate acid drainage and to leach metals and other contaminants, although some units are not presently generating acid drainage. Water quality was generally expected to become acidic and have increased sulfate concentrations. The potential for infiltration of contaminated water to impact deeper groundwater was considered low due to surface water/groundwater interaction (groundwater losing to surface water in all cases) at higher elevations.

Mitigation included consolidation and backfilling of acid-generating waste, water barrier liners, water balance reclamation covers and revegetation to significantly reduce impacts to groundwater and surface water quality in the various drainages. Water treatment plants (lime precipitation with additional arsenic treatment) at the Zortman and Landusky mines would be used to treat water in perpetuity. Short-term biological treatment was also proposed to reduce cyanide, selenium and nitrate levels for leach pad waters being discharged.

According to the EIS, downgradient water quality predictions showed a wide range of possible concentrations. Therefore, continued monitoring and provisions for supplemental capture and treatment were proposed to prevent significant impacts to water quality. Spent ore on the L87/91 pad is expected to be a significant source of acid generation in the future. Water quality impacts in the northern drainages were predicted to increase if the acid generating material from the L87/91 pad was placed as pit backfill in the headwaters of these drainages. Concentrations of most contaminants from the Landusky Mine were predicted to increase over time. Pit backfilling was expected to increase loads of contaminants in the short term due to the disturbance of acid-generating material, the re-establishment of flowpaths and mobilization of soluble oxidation products (metal-sulfate salts).

6.3.17.2. ACTUAL WATER QUALITY CONDITIONS

1993 EA

Acid has developed from waste rock dumps and ore heap retaining dikes. The flow of acidic water from the toe of the dump and observed venting of sulfurous steam from portions of the dump are manifestations of the sulfide oxidation reactions occurring within the dump. Mill Gulch waste dump has generated acid drainage with pH periodically dropping as low as 3.9. Based on field inspections, BLM and DSL found that approved operating and reclamation plans were not preventing acid drainage. Mill Gulch and upper Sullivan Creek have become acidic as a result of pyrite oxidation in waste rock placed in Mill Gulch Waste Dump, the Sullivan Park dike, and possibly places within the excavated foundation of the 1991 leach pad. Surface water monitoring sites in Sullivan Creek were impacted by acid drainage from the 1991 leach pad, with pH between values between 2.6 and 2.8. Groundwater samples downstream of the Sullivan Park dike indicate that sulfate concentrations in the alluvial groundwater near the facility have increased.

1996 EIS

Acid drainage is currently being generated from pit walls and floors, leach pads and pad foundations, and waste rock piles.

2001 EIS

Acid drainage with metals, metalloids, nitrate and cyanide is common in groundwater at the site and is impacting surface water quality. Capture and treatment of discharges is effective at reducing discharges to below regulatory standards except for arsenic (treatment method is effective but was not always employed by Pegasus).

Recent Water Quality Monitoring Data

Recent (through 2005) surface water quality monitoring data from Montana DEQ indicates the 2001 EIS was correct in identifying mitigation and improving groundwater quality and protecting surface water quality. The notable exception has been in Swift Gulch where surface water quality has worsened, with higher sulfate and metals concentrations. Characterization of the source of Swift Gulch contamination has been difficult and has made identification of potential mitigation measures problematic.

6.3.17.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.22 provides a summary and comparison of potential, predicted and actual water quality information for the Zortman and Landusky mines. The accuracy of the predictions is discussed in this section.

Table 6.22. Zortman and Landusky, MT, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Heap Leach Piles, Open Pit, and Waste Rock Dumps	• 1979 EIS: only oxide ore and no potential identified other than cyanide • 1993 EA: potential for impacts from acid drainage including pH, sulfate, Cd, F, Zn, As, and nitrate. • 1996 EIS: strong potential to generate acid drainage and high TDS, sulfate and metals values • 2001 EIS: high potential to generate acid drainage with pH, sulfate, metals, metalloids, cyanide and nitrate.	• 1979 EIS: only oxide ore to be mined; stormwater controls and liners to prevent cyanide seepage • 1993 EA: reclamation caps (water barrier); groundwater capture and treatment for acid drainage and cyanide, stormwater controls. • 1996 EIS: waste segregation; water balance and water barrier reclamation covers; groundwater and surface water capture and treatment for cyanide, nitrate, acid drainage, metals and other contaminants • 2001 EIS: waste consolidation; reclamation covers, water capture and perpetual treatment	• 1979 EIS: no water quality impacts predicted • 1993 EA: no additional water quality impacts predicted • 1996 EIS: reduced water quality impacts predicted • 2001 EIS: Contaminants to increase over time but surface water quality expected to meet standards. Concentrations of most contaminants from the Landusky Mine are going to increase over time. Pit backfill expected to increase loads of contaminants in the short term due to the disturbance of acid generating material, the re-establishment of flowpaths and mobilization of 'soluble oxidation products'	1993 EA: acid drainage from waste rock dumps and heap leach retaining dikes. Surface water impacted by acid drainage with pH 2.6-2.8. Increased sulfate in groundwater • 1996 EIS: multiple 100+-yr storm events; extensive groundwater and surface water contamination with acid drainage and metals/metalloids, nitrate, cyanides • 2001 EIS: acid drainage with metals, metalloids, nitrate, cyanide common throughout groundwater and in surface water

Low pH and elevated sulfate concentrations in surface water and groundwater: The 1979 EIS indicated no potential for contaminants other than cyanide, based only on oxide ore being mined. The potential for development of acid drainage and groundwater and surface water impacts from acid drainage was not acknowledged in the 1997 EIS. The 1993 EA identified the potential for impacts from acid drainage, sulfate, metals, arsenic and nitrate. Acid drainage from waste rock dumps and heap leach retaining dikes was already impacting groundwater and surface water, but no additional water quality impacts were predicted as a result of capture and treatment. The 1996 EIS indicated strong potential for acid drainage from waste rock and high TDS, sulfate and metals values. Multiple 100+-year storm events led to impacts to surface water and groundwater from acid drainage associated with both waste rock both in dumps and used as leach pad base material. Reduced impacts on water quality were predicted. The 2001 EIS

indicated a high potential to generate acid drainage from waste rock with pH, sulfate, metals and metalloids along with cyanide and nitrate. Metals and metalloids, nitrate and cyanide are common in groundwater and surface water, and contaminants were expected to increase over time; however, surface water quality was expected to be protected.

6.3.18. FLORIDA CANYON, NEVADA

The Florida Canyon Mine, owned by Florida Canyon Mining Company (parent company was formerly Pegasus Gold and now Apollo Gold), has been in operation since 1986. The primary commodities mined are gold and silver from open pit mining and heap leach processing operations. It disturbs 2,149 acres on BLM land. It has a current financial assurance amount of $16.9 million.

6.3.18.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EA was completed in 1986 (not reviewed). In 1995 an EA was conducted for a mine expansion (not reviewed), in 1997 an EIS was conducted for a mine expansion and reclamation, and another expansion EIS was completed in 1999 (not reviewed). The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1997 EIS

According to the 1997 EIS, old mineralization is associated with quartz-veining as auriferous pyrite and free gold. Static testing (ABA), whole rock analysis, short term leach testing (MWMP), kinetic testing (humidity cell and column leach testing) and petrographic analyses were performed. Constituents of concern identified in whole rock and MWMP tests included aluminum, arsenic, cadmium, iron, lead, mercury, antimony, thallium and total dissolved solids (TDS). Static tests showed that 41.5% of the rock had the potential to produce acid and an additional 36.2% of the whole rock had uncertain potential to produce acid. According to the EIS, the modified Sobek method was used to fine-tune the estimate. The result was that only 0.2% of mined rock was identified as having potential to generate acid drainage. Kinetic tests were inconclusive but tended to show a low acid generation potential. However, two of the 14 samples showed acid generating potential. MWMP tests also showed the potential for leaching aluminum, arsenic and iron. HELP, OPUS and UNSAT2 were used to model waste rock seepage.

The EIS characterized baseline groundwater quality; in some wells the EIS claims that concentrations already exceeded drinking water standards for arsenic, aluminum, chloride, manganese, sulfate, TDS, fluoride, and nickel. According to the EIS, even though these samples were taken just downgradient of the heap and pit eight years after the mine commenced construction, the results were attributed to different water quality in different aquifers rather than mining activities. However, the EIS also mentions that groundwater may be impacted by seepage from the heap leach facility, waste rock dumps and by the release of constituents from the pit backfill material. The potential was recognized for dissolution of constituents from the backfill to degrade groundwater quality. No information was presented on surface water quality impact potential or pit water impact potential.

According to the EIS, mitigation consisted of segregating and disposing of potentially acid generating materials within the waste rock dumps. The heap leach facility will be designed as a zero discharge facility and employ a leak detection system. Partial backfilling of the open pit above the water table will eliminate the formation of a pit lake. No impacts to ground water quality were expected as a result of backfilling of the pit with waste rock. Water quality impacts from waste rock dumps were not expected due to low seepage rate, low acid generation potential, natural attenuation properties of alluvium, depth to groundwater, and the waste rock management plan. Contamination of groundwater by leach solution was not expected.

6.3.18.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring data were obtained from the Nevada Department of Environmental Protection (NDEP) for the period 1999 to 2003. Twenty-four groundwater monitoring locations are noted, although not all are in use. No surface water monitoring locations were noted. Information was available on baseline water quality conditions and water quality violations.

Following the 1997 EIS, there were numerous water quality impacts. One monitoring well had elevated concentrations of cyanide (WAD CN = 0.225 mg/l) and other constituents (chloride, mercury, nitrate, and TDS) in groundwater beginning in 2000, suggesting contamination of groundwater with cyanide leach solutions. Following actions taken to address deficiencies in the heap leach pad leak detection pump back system, lower elevations of constituents were noted, although mercury concentrations still exceeds standards. A Notice of Violation was issued for using higher pumping rates than those for which the system had been designed.

Other groundwater monitoring wells on the site showed exceedences of drinking water standards for aluminum, arsenic, cadmium, chloride, iron, manganese, nickel and TDS.

6.3.18.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.23 provides a summary and comparison of potential, predicted and actual water quality information for the Florida Canyon Mine. The accuracy of the predictions is discussed in this section.

Table 6.23. Florida Canyon, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Leach Pads	1997 EIS: • Seepage from the heap leach facility. • Background water quality indicates natural exceedences.	1997 EIS: Facility design to prevent groundwater impacts (zero discharge with leak detection with pumpback of leaks if detected	1997 EIS: No impacts to groundwater predicted	WQ Monitoring: Contamination of groundwater with cyanide and other constituents noted and partially mitigated with leak pumpback system
	Waste Rock, Open Pit, or baseline conditions	1997 EIS: Water quality would be same as pre-mining (background water quality indicates natural exceedences).	1997 EIS: • Backfill pit to prevent formation of pit lake. • Segregation/disposal of PAG rock in the waste rock dumps	1997 EIS: No impacts to groundwater predicted.	WQ Monitoring: Exceedences of drinking water standards noted in various monitoring wells, which could be attributed to waste rock and open pit leachate or baseline conditions.

Contamination of Groundwater by Seepage from the Leach Pad: Groundwater in at least one well has been impacted by cyanide, mercury, chloride, nitrate and TDS from heap pad leachate. Short-term leach tests results were elevated (above drinking water standards) for aluminum, arsenic, iron, lead, mercury, thallium, and TDS, so this test was predictive for mercury and TDS. The EIS noted that there was the potential for groundwater quality impacts by seepage from the heap leach facility, waste rock dumps, and by release of constituents from the pit backfill material.

The heap leach facility was designed as a zero-discharge operation with a leak-detection system, and contamination of groundwater by leach solution was not expected. Therefore, the potential groundwater quality forecast was correct, and the post-mitigation (predicted) groundwater quality impacts were incorrect. The assumption/prediction that leach pad mitigation (liner and leak detection system) would be effective in preventing groundwater contamination was inaccurate.

Elevated Concentrations of Metals and Sulfate in Groundwater: The possible causes of the observed exceedences are currently not known but include elevated background concentrations, seepage from the waste rock dumps, and infiltration from the open pit. The constituents that exceed concentrations in groundwater (aluminum, arsenic, cadmium, chloride, iron, manganese, nickel, TDS) are very similar to those exceeding standards in the MWMP (short-term leach) test (aluminum, arsenic, iron, lead, mercury, thallium, TDS). Therefore, the short-term leach tests were predictive in identifying constituents that would be elevated in groundwater, regardless of the cause.

6.3.19. JERRITT CANYON, NEVADA

The Jerritt Canyon Mine, owned currently by Queenstake Resources, has been in operation since 1980. The primary commodities mined are gold and silver from underground and open pit mining and heap and vat leach processing operations. It disturbs 3,411 acres on Humboldt-Toiyabe National Forest in U.S. Forest Service Region 4. It has a current financial assurance amount of $7.1 million.

6.3.19.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EIS was completed in 1980. In 1991, an EA was completed in support of an increase in the height and an expansion of the seepage collection system of the tailings impoundment. In 1994 another EIS was conducted for a mine expansion. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1980 EIS

According to the 1980 EIS, results from short-term leach tests conducted on waste rock samples showed only minimal potential for leaching of heavy metals and other toxic substances to surface and groundwater. However, suspended solids from erosion were expected to increase. No other information was provided on tailings testing or potential for water quality impacts in the 1980 EIS.

According to the EIS, mitigation will consist of locating the mill and tailings impoundment in the headwaters of a small watershed, and this was expected to have negligible effects on water quality. The tailings impoundment will be lined to provide an impervious barrier to vertical movement. Horizontal seepage of liquids will be controlled by the dam embankment design. Diversion ditches will direct flow around the mine pit and back into natural drainages (run on controls). Groundwater flowing into the pits will be used for dust control, and at times, excess water may be discharged to Jerritt Canyon.

The EIS included information on background surface water sampling stations that showed elevated nitrate concentrations, anomalous values for zinc, and exceedences of the drinking water standard for mercury and chromium.

1991 EA

This EA was written to analyze a 50-foot height increase to the tailings impoundment and to install a seepage remediation system. There were no geochemical tests performed on tailings material.

Even though the EA analyzed the new seepage remediation system, it did not provide details of the ongoing contamination (see Section 6.3.19.2), other than to indicate that pre-mining background water quality was within

standards and that a plume of salt extended up to 1000 feet from the tailings impoundment. The EA indicated that concentrations of constituents seeping from the tails were relatively low. It indicated the six pumpback wells previously installed were not sufficient to prevent migration away from the impoundment.

1994 EIS

According to the EIS, geochemical testing on waste rock included static acid-base accounting, humidity cell, column leaching and short-term leach (MWMP) tests. Constituents of concern identified from waste rock leach tests included arsenic, selenium, nitrate and sulfate. Waste rock from the Roberts Mountain and Hanson Creek formations had low acid-generation potential. Waste rock from the Snow Canyon formation had moderate potential to generate acid. Waste rock from the unoxidized, strongly altered intrusive rock was acid-forming but would make up less than 2% of the waste rock in the proposed waste rock dumps. Groundwater quality would be potentially affected if waste rock and pits generate acid and mobilize metals and other compounds. Spring and seep water quality may be affected by contact with waste rock dumps, or by contact with pit walls. There is potential for acid drainage from waste rock, ore stockpiles or pits to affect waterways, and a potential increase in sedimentation resulting from roads, pits and waste rock dumps.

According to the EIS, mitigation would consist of the Saval, Steer, Burns Basin pits (proposed) lying above the regional groundwater table and not accumulating water. The New Deep deposit will be mined using underground techniques, so no pit lake will form. No existing pit has encountered the regional groundwater table. Acid mine drainage will be mitigated with selective handling and isolation of acid forming waste rock and capping, contouring, or drainage control to reduce infiltration. No impacts to surface or ground water were predicted due to the implementation of the waste rock characterization and handling program and plugging of the underground workings.

6.3.19.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring data was obtained from the Nevada Department of Environmental Protection (NDEP) for 1997-1998 and 2000- 2003. Twenty-one surface water monitoring locations and seven groundwater monitoring locations were identified. In addition, one Notice of Violation (NOV) was identified.

The records showed that following the 1980 EIS and 1994 EIS, water quality impacts occurred at the site including the following:

- A Finding of Alleged Violation (FOAV) was issued in 1991 due to a cyanide plume in the groundwater, caused by seepage from the tailings impoundment. A seepage collection system was installed to pump tailings seepage back to the tailings facility.
- Groundwater monitoring wells downgradient of the tailings impoundment showed exceedences for chloride (chloride and total dissolved solids (TDS), with values peaking at 30,000 mg/l (TDS) and 12,000 mg/l chloride in well GW-9. Exceedences of over times federal drinking water standards were common for these constituents, with exceedences of over 10 times standards occurring constantly between 1993 and 2004. Exceedences of federal arsenic and sulfate drinking water standards were also occasionally noted. The tailings impoundment is being gradually evaporated to eliminate seepage.
- Surface monitoring points in drainages below waste rock dumps on Burns Creek, Mill Creek, Jerritt Creek, Snow Creek and Sheep Creek showed exceedences of secondary federal drinking water standards for TDS and sulfate. One surface monitoring site showed a steady increase in TDS and sulfate concentrations from 2001-2004, with exceedences of over 10 times standards for both by early 2004. The exceedences were most likely related to the waste rock disposal pile.

6.3.19.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.24 provides a summary and comparison of potential, predicted and actual water quality information for the Jerritt Canyon mine. The accuracy of the predictions is discussed in this section.

Table 6.24. Jerritt Canyon, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater and Surface Water	Tailings	• 1980 EIS: No information provided for groundwater. Possibility of release of toxic materials to streams due to breakage of the tailings pipeline.	• 1980 EIS: Tailings located in headwaters of small water shed will protect water quality • 1980 EIS: Facility design to prevent groundwater impacts ○ Tailings disposal pond will be lined ○ Horizontal seepage controlled by embankment design.	• 1980 EIS: No impacts predicted • 1991 EA: Six pumpback wells are not effective at preventing migration of plume from impoundment	Water Quality Monitoring • 1991: Cyanide plume detected from tailings pond and seepage collection installed • 1993-2004: Groundwater monitoring wells downgradient of the tailing impoundment show exceedences for Cl and TDS consistently from 1993 –2004
	Waste Rock	• 1980 EIS: Minimum potential for some leaching of some heavy metals and other toxic substances in the waste rock into surface and ground water • 1994 EIS: Groundwater and surface water quality may be affected by acid drainage and other constituents in waste rock	• 1980 EIS: No information provided • 1994 EIS: Waste rock mitigation include: ○ Segregation and blending of PAG waste rock. ○ 1994 EIS: Capping, contouring and drainage controls ○ 1994 EIS: Waste rock characterization and handling (segregation, cap, contour, drainage) program	• 1980 EIS: Minimum impacts predicted • 1994 EIS: No impacts to groundwater or surface water predicted	Water Quality Monitoring • 2001-2004: Surface monitoring shows a steady increase in TDS and SO_4 concentrations downstream from waste rock piles from 2001-2004 with most recent data indicating exceedences of standards by 10 times
	Open Pit	• 1980 EIS: No information • 1994 EIS: Groundwater and surface water quality may be affected by acid drainage and other constituents in pit walls	1980 EIS: Divert surface water flow around pit and groundwater from pit used for dust control or discharged	• 1980 EIS: No impacts predicted • 1994 EIS: No pit lakes predicted to form	

Cyanide Plume and Exceedences of Chloride, TDS, Sulfate and Arsenic in Groundwater from Tailings Impoundment Leakage: The tailings generated from the vat leach operation were responsible for creation of a cyanide plume in groundwater. Exceedences of chloride, TDS, arsenic and sulfate were also observed in wells downgradient of the tailings impoundment. Geochemical characterization in the 1994 EIS focused on the waste rock and noted the potential for leaching of arsenic, selenium, nitrate and sulfate. However, no geochemical testing was performed on tailings material. No information on potential (pre-mitigation) groundwater impacts from tailings was noted, but post-mitigation (related to waste rock and underground mine backfilling and sealing) groundwater quality was predicted to

be good. The only potential impact from tailings was the possibility of release of toxic materials to streams due to breakage of the tailings pipeline. The tailings impoundment was lined and had seepage control features, but these were not adequate to prevent groundwater contamination. Therefore, predictions about the impact of tailings on groundwater were non-existent, and the mitigation for the tailings system failed.

Impact of Waste Rock on Surface Water Quality: Exceedences of sulfate and TDS (by over 10 times the standard) were observed in surface water downstream/gradient of the waste rock piles. Acid-base accounting and short-term leach testing performed on waste rock showed moderate potential for acid drainage and minimal potential for leaching of arsenic, selenium, nitrate, and sulfate. Potential surface water impacts from waste rock were noted in the EISs. However, no impacts to surface water or groundwater were predicted post-mitigation due to the implementation of the waste rock characterization and handling program. Therefore, the potential (pre-mitigation) forecasts were more accurate than the post-mitigation predictions, and the mitigation and management approaches were not successful in preventing surface water impacts from waste rock. Geochemical characterization was able to predict the leaching of sulfate from waste rock, but the impact was larger (>10 times standards) than the "minimal" leaching predicted.

6.3.20. LONE TREE, NEVADA

The Lone Tree Mine, owned by Newmont Mining Company, has been in operation since 1991. The primary commodities mined are gold and silver from open pit mining and heap and vat leach processing operations. It disturbs 2,691 acres and is permitted to disturb 3,547 on both private land and BLM land. It has a current financial assurance amount of $8.4 million.

6.3.20.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was not originally required for the new project in 1991 because it was located on private land. NEPA was required for mine expansion onto public land, and an EIS was completed in 1996. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1996 EIS

Geochemical characterization consisted of static (ABA), kinetic (humidity cell tests), and short-term leach (MWMP) tests and a mixing experiment using acid leachate from Lone Tree rocks and Wayne Zone groundwater. Modeling included water quantity and water quality using MINEDW to predict three-dimensional groundwater flow, and hydrogeochemical modeling of pit lake water by PTI (proprietary). Constituents of concern identified included arsenic, iron, sulfate and total dissolved solids (mine discharge water); antimony, arsenic, cadmium, nickel, fluoride, and sulfate (pit lake); and arsenic, copper, cyanide, iron and sulfate (tailings).

Although static testing indicated that tailings were potentially acid generating, kinetic testing indicated they were not. Sulfides were reported to be encapsulated in silica; humidity cells tests on overburden suggested that silicate buffering would be important. The contaminant leaching potential was predicted to be moderate to high.

Groundwater - Pit lake water was predicted to mix with groundwater after steady state groundwater levels are reached; due to natural attenuation, no groundwater exceedences were expected.

Surface Water - Water pumped from the ground and discharged into the Humboldt River is generally of good quality, except for recently increased concentrations of arsenic, iron and sulfate in mine discharge water (Draft EIS). The Final EIS stated that iron, copper and lead exceeded aquatic life criteria in mine discharge water.

Pit Lake - Pit lake water quality was predicted to be acidic and exceed the arsenic standard initially but become neutral after 10 years and not exceed standards for arsenic after that time; cadmium concentrations were predicted to exceed drinking water standards for one year; nickel, fluoride, and antimony for over 25 years; and sulfate until 10 years. Nickel and fluoride concentrations were predicted to exceed their respective limits by less than 10 times and

antimony by over 10 times. In the long term, the pit water was predicted to have exceedences of one to 10 times for aluminum, antimony, arsenic, fluoride, total dissolved solids and pH. The drinking water standard for thallium was predicted to be exceed by over 10 times in long term.

6.3.20.2. ACTUAL WATER QUALITY CONDITIONS

Water monitoring and compliance data for the period 1998-2002 were obtained from the Nevada Department of Environmental Protection (NDEP). There are 16 groundwater monitoring locations (11 monitoring wells and five production wells) at Lone Tree. No information on violations was found.

Possible mine water quality related impacts and exceedences were indicated including the following:

- Mine Water Supply Wells: Production well WW-13 exceeded the secondary standards for fluoride and manganese in 1998 and 2000. Concentrations of both constituents were less than twice the standard.
- Heap leach groundwater monitoring wells: Occasional exceedences of Secondary MCLs were recorded at wells MO15-1A, MO15-2A, MO15-3 3 from 1999-2000 for aluminum, iron, and TDS. Except for an aluminum concentration of 1.05 mg/l (standard is 0.05-0.2 mg/l), all concentrations were less than twice the drinking water standard.
- Tailings monitoring wells: Tailings monitoring wells recorded numerous exceedences of secondary drinking water MCLs from 1999-2002. Constituents of concern included fluoride, iron, manganese and TDS. Frequent fluoride SMCL exceedences were recorded from 1999-2001, but the primary MCL (4.0 mg/l) was not exceeded. Some tailings monitoring wells had arsenic concentrations at the level of the new standard (10 μg/l) in 2000 and 2002.
- The tailings impoundment experienced a major leak in November, 2000, but the leak was not detected below the vadose zone.
- Between 1998 and 2002, dewatering water discharged into the Humboldt River exceeded standards frequently for pH, total dissolved solids, fluoride, boron and un-ionized ammonia.

6.3.20.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.25 provides a summary and comparison of potential, predicted and actual water quality information for the Lone Tree mine. The accuracy of the predictions is discussed in this section.

Exceedence of Arsenic and Secondary Drinking Water Standards in Groundwater: Because information on background groundwater quality was not obtained, it is unknown if the observed exceedences in groundwater relate to seepage from facilities or background conditions. Heap leach monitoring wells had exceedences of arsenic, aluminum, iron and TDS. Tailings monitoring wells had exceedences of arsenic, fluoride, iron, manganese and TDS. Potential water quality impacts noted in the EIS included discharge of acid water from overburden, tailings, leach pads and ore stockpiles. Tailings MWMP extract for tailings exceeded drinking water standards for pH, TDS, sulfate, arsenic, copper, iron (all by <10x) and cyanide (>10x). These results did not predict noted exceedences of fluoride or manganese in tailings wells. No acid drainage has occurred to date.

Exceedence of Permit Limits for Dewatering Discharge: More information is needed on NPDES discharge water quality. The EIS predicted that no significant impacts would occur to the Humboldt River after mitigation were performed, which included cooling and treatment of discharge water to remove arsenic.

Table 6.25. Lone Tree, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	MITIGATION	Predicted Impacts	Actual Impact
Groundwater	Heap Leach	1996 EIS: No estimates of potential impacts to water quality	1996 EIS: No specific mitigation provided	1996 EIS: No estimates of predicted water quality	WQ Monitoring: possible exceedences of As, Al, Fe, and TDS
	Tailings	1996 EIS: No potential for acid drainage. Moderate to high potential for As, Cu, CN, Fe, and sulfate	1996 EIS: No specific mitigation provided	1996 EIS: No estimates of predicted water quality	WQ Monitoring: possible exceedences of secondary drinking water MCLs from 1999-2002 for fluoride, iron, manganese, and TDS
	Waste Rock	1996 EIS: No estimates of potential impacts to water quality	1996 EIS: Overburden mixing and segregation	1996 EIS: No estimates of predicted water quality	WQ Monitoring: No exceedences indicated
	Open Pit	1996 EIS: Pit lake water quality acidic initially, but after 10 yr neutral; would exceed standards for As, Cd, Ni, F, Sb (by >10x), Tl (by >10x), and SO_4 at different times	1996 EIS: Diversions to prevent runoff from entering pits	1996 EIS: Groundwater downgradient from mine pit would approach baseline quality of regional groundwater, not expected to exceed MCLs	
Surface Water	Pit Dewatering	1996 EIS: Fe, Cu, and Pb are the only parameters that exceeded aquatic life criteria in mine discharge water	1996 EIS: Affected springs mitigated by: piping in water, drilling into a deeper aquifer, improving existing springs to enhance yield, or developing/improving nearby springs to offset loss. Monitoring	1996 EIS: No significant impacts would occur, but discharge to Humboldt River would increase total dissolved solids and trace elements	Water pumped from the ground and discharged into the Humboldt River Discharge exceeds permit limits for TDS, B, F, pH and NH_3.

6.3.21. ROCHESTER, NEVADA

The Rochester Mine, owned by Coeur Rochester, Inc., has been in operation since 1986, although the site has been mined since the 1860s. The primary commodities mined are gold and silver from open pit mining and heap leach processing operations. It disturbs 1,447 acres on both private land and BLM land. It has a current financial assurance amount of $8.4 million.

6.3.21.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EA was completed in 2001. In 2003 an EA was conducted for a mine expansion. There has never been an EIS completed for this facility, but beginning in 2004 the BLM began preparing a closure EIS. The following sections summarize the water quality predictions made in the NEPA documents.

2001 EA

The 2001 EA considered the Nevada Packard deposit, which was a satellite deposit from the primary Rochester project. Geochemical characterization consisted of acid-base accounting, short-term leach testing (MWMP) and whole rock analysis. Constituents of concern identified included antimony, arsenic, iron, lead, mercury and silver. No predictive modeling was performed. Acid drainage potential was estimated to be low. Rocks in the project area generally have low sulfur content and low neutralizing potential. Only two of 26 acid-base accounting results showed potential to generate acid. Whole rock (ICP) analyses of non-ore and unmineralized rock samples suggested that antimony, arsenic, lead, mercury and silver could produce leachate with elevated concentrations. Short-term leach test (MWMP) results showed that antimony, arsenic, iron and mercury could occur in elevated concentrations in discharge water from the non-ore material.

There was no information in the 2001 EA on potential impacts to groundwater. Due to historic mining in the area, the current site includes abandoned tailings material, waste dumps and leach pads that are likely to have an impact on surface water quality. The water table is 140 feet below the proposed pit bottom, so no pit lake is expected to form. No information on mitigation was provided.

The proposed action was considered unlikely to degrade groundwater resources or further degrade baseline surface water quality, since a part of the proposed action included reclamation of the abandoned pre-Coeur workings.

2003 EA

This was the most recent EA to consider continuing expansions of projects at the Rochester Mine. Reports of earlier testing showed that some of the lithologies above 6,600 feet were substantially acid generating, but no details were provided. Below 6,600, from 10 to 20 percent of the rock was classified as potentially acid generating (PAG), based on acid-base accounting and humidity cell analysis. MWMP tests showed limited metal mobility from non-PAG rock, but test pH values ranged from 4.0 to 6.4. For PAG rock, lead, cadmium, zinc, copper and aluminum concentrations were occasionally high.

The section on potential impacts claimed that the rock was mostly non-PAG, and the surrounding rock would neutralize any acid that may be generated.

Future developments at the Coeur operations could generate long-term impacts to groundwater. The potential for acid rock drainage from the present actions was identified.

6.3.21.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring and compliance data were collected from the Nevada Department of Environmental Quality (NDEP) for the period 2000- 2003. Three surface water monitoring locations and 17 groundwater monitoring locations were noted for the site. The following information on water quality was noted.

- Groundwater monitoring wells downgradient of the Stage I heap leach pad showed exceedences of arsenic, mercury, cadmium, nitrate and WAD cyanide during the period 2000 to 2003.
- Surface water monitoring sites in a spring downgradient of the Stage I heap leach pad showed exceedences of nitrate, lead, cyanide, arsenic, mercury.
- In 2003 NDEP issued Rochester a Finding of Alleged Violation (FOAV) for cyanide exceedences discovered during quarterly monitoring. The violation was issued in response to the discovery of cyanide exceedences in MW-16, a monitoring well screened in the shallow bedrock below the site. Contamination had been previously confined to the alluvium.
- In 1987 a release of process solution from the East Pregnant Pond occurred, causing pregnant solution to run into American Canyon for 12-18 hours at a rate of 5-10 gpm. The United States EPA issued a Notice of Violation to Coeur-Rochester on June 30[t], 1988, for violating the Clean Water Act by discharging pregnant

solution to American Canyon. On July 20th, 1988, NDEP issued an FOAV to Coeur-Rochester for the December 27th, 1987, pregnant solution release. It does not appear that NDEP pursued a monetary settlement.

- In 1998 a broken pipeline resulted in the displacement of 200 tons of ore off the liner, causing 19,400 gallons of process solution containing 45.3 lbs. of cyanide to be released to the environment. Of this, 5,000 gallons of process solution containing 11.7 lbs. of cyanide were discharged off site to American Canyon, an intermittent drainage. A dike was installed in American Canyon to stop solution flows, and affected soil was treated with hydrogen peroxide to degrade cyanide. Displaced ore was moved back to containment.

6.3.21.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.26 provides a summary and comparison of potential, predicted and actual water quality information for the Rochester Mine. The accuracy of the predictions is discussed in this section.

Table 6.26. Rochester, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impact
Groundwater	Heap Leach, Open Pit, Waste Rock	2001 EA: None identified. 2003 EA: Future developments at the Coeur operations could generate long-term impacts to groundwater.	2001 EA: None identified 2003 EA: None identified	2001 EA: The proposed action is considered unlikely to degrade groundwater resources. 2003 EA: Water recharging the groundwater system from infiltration through Rock Disposal Sites not expected to differ from the current groundwater chemistry.	WQ Monitoring: Leaks from the Stage I heap leach pad and the N. Barren pond have resulted in numerous exceedences in groundwater monitoring wells. Exceeding constituents include WAD Cyanide, mercury, cadmium, nitrate and arsenic.
Surface Water and Springs	Heap Leach, Open Pit, Waste Rock	2001 EA: Due to historic mining, current site includes abandoned tailings, waste dumps, and leach pads that are likely to have an impact on t surface water quality. 2003 EA: There is a potential for increased sedimentation from surface disturbance associated with Proposed Action. There is potential for acid drainage from the present actions (2003)	2001 EA: Diversion ditches, as well as other sediment control measures. 2003 EA: Part of the proposed action includes reclamation of the Project, as well as some of the abandoned pre-Coeur mine workings.	2001 EA: Proposed action unlikely to further degrade surface water quality. 2003 EA: The proposed action is unlikely to further degrade baseline water quality, since part of the proposed action includes reclamation of project as well as some abandoned pre-Coeur mine workings.	Contamination of American Canyon (intermittent drainage) by process solution release of Nov. 29th, 1998. Exceedences of nitrate and arsenic in American Canyon Springs from heap leach pad and process solution ponds.

Exceedences of Arsenic, Mercury, Cadmium, Nitrate and Cyanide in Heap Leach Monitoring Wells and Springs: Short-term leach tests and whole rock analysis identified antimony, arsenic, iron, lead, mercury and silver as constituents of concern. Therefore, the potential for arsenic and mercury exceedences was identified, but the cadmium, nitrate and cyanide exceedences were anticipated. There was no information on potential or predicted

impacts to groundwater in the 2001 or 2003 EAs related to the heap leach pad. Therefore, the potential for some of the observed exceedences was noted in the 2001 EA, but the observed exceedences were not predicted to occur in groundwater.

Contamination of American Canyon by Cyanide from Process Solutions: Cyanide was not specifically identified as a constituent of concern, and no potential or predicted impacts from release of process solution to surface water were identified. Therefore, the observed impact to surface water was not predicted in the EAs.

6.3.22. ROUND MOUNTAIN, NEVADA

The Round Mountain Mine, owned by Round Mountain Gold Corporation, has been in operation since 1977. The primary commodities mined are gold and silver from open pit mining and heap leach and vat leach processing operations. It disturbs 4,431acres on private, BLM and Forest Service lands. It has a current financial assurance amount of $41.7 million.

6.3.22.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EA was completed in 1977. In 1987 and 1992, EAs were conducted for a mine expansions, In 1996 an EIS was conducted for further mine expansion. The following section summarizes the water quality predictions made in the only NEPA document obtained and reviewed, the 1996 EIS.

1996 EIS

The primary host rock for mineralization is the Tertiary Round Mountain tuff, in which gold occurs in quartz-carbonate and quartz-pyrite veins. Geochemical characterization consisted of short-term leach testing, static acid-base accounting, kinetic testing and soil attenuation tests. MWMP tests were performed on leach pad offload materials (spent ore), and TCLP and MWMP tests were performed on tailings materials. Net neutralization potential (NNP) and humidity cell tests were performed on pit wall materials. Soil attenuation tests were conducted on leachate from leach offload piles. The effects of mine dewatering and future inflow of water to the pit were predicted using MODFLOW. The pit lake was modeled with CE-THERM-R1 for thermal stratification and overturn, and MINTEQA2 for geochemistry of the pit lake. The Davis-Ritchie model was used to calculate the thickness of the oxidized zone in the wall rock. Groundwater quality was sampled for four different water types, including geothermal waters since 1986, which provides a baseline to compare this project against. The groundwater near the tailings impoundment was not monitored.

There are two facilities in which spent ore will be deposited: leach offload piles and tailings impoundments. Spent ore was identified as having the potential to generate elevated pH values and to leach antimony, arsenic, selenium, and cyanide, and possibly iron, mercury, nickel, nitrate, and fluoride, as well as generating elevated pH values. Geochemical test results suggested that degradation could occur if water were to seep through the leach offload piles and discharge directly into a protected surface water source or groundwater aquifer. The potential was identified for stormwater runoff to mobilize metals and cyanide from the spent ore materials. However, significant impacts to surface water or groundwater quality from leach offload piles was not anticipated due to attenuation in soils.

The potential was identified for carbon-in-leach tailings to leach iron, lead, manganese, TDS and sulfate in concentrations in excess of MCLs; carbon-in-leach tailings, however, would be only 5-10% of total tailings. MWMP test average concentrations on spent ore showed exceedences of over 10 times for arsenic and less than 10 times for antimony, selenium, and cyanide. The pH was also higher than standards. Based on TCLP tests, tailings did not exhibit hazardous properties. If tailings seepage reaches groundwater, there is potential for degradation.

The EIS proposed a zero-discharge tailings facility with a seepage underdrain system designed to alleviate head. If, after cessation of mine processing operations, seepage of tailings solution is still occurring through the underdrain

system, the seepage would create a potential impact to groundwater. Any metals and cyanide mobilized by snowmelt or rainfall that runs off the piles or seeps through the piles and later infiltrates the alluvial soils would be rapidly attenuated in the upper soil column, indicating that significant impacts to groundwater from the leach offload piles were not expected.

Excavation of the pit was predicted to expose sulfide minerals and form acid drainage. A 300-foot deep pit lake is expected to form in the pit after dewatering ceases. Forty percent of pit wall samples had potential to generate acid, but modeling indicated that the pit water will not be acidic. In the long run, pit water was predicted to exceed drinking water standards for aluminum, arsenic, fluoride, manganese, mercury, nickel, pH (high), TDS, sulfate and zinc. Modeling of final groundwater levels and flow rates, as well as predicted precipitation and evaporation rates suggested that the pit lake will have no net outflow to either groundwater or surface waters.

6.3.22.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring and compliance data were collected from the Nevada Department of Environmental Protection (NDEP) for the period 1999-2003. Ten groundwater monitoring locations were noted for the site. The following information on water quality was noted:

- Groundwater monitoring wells recorded a number of exceedences of secondary standards for aluminum, fluoride, iron, manganese and TDS. Aluminum exceedences occurred in the pit dewatering water. The other constituents all had exceedences in alluvial wells downgradient of the tailings, heap offload disposal sites and dewatering water. One of the wells had a substantial increase in fluoride concentration. Arsenic exceedences, of both the old and new standards, were very common and are mentioned as a background condition.
- Wells near the tailings also experienced frequent exceedences for antimony and lead. High pH values were also common.
- As noted, the trend in exceedences is for them to be clustered near the tailings and the heap offload sites. A second trend is for the highest concentrations to occur at the shallowest alluvial reaches, which could suggest a surface source. Most of the constituents, but not fluoride, also occur in dewatering water, which is another potential source.

6.3.22.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.27 provides a summary and comparison of potential, predicted and actual water quality information for the Round Mountain Mine. The accuracy of the predictions is discussed in this section.

Exceedences of Aluminum, Antimony, Fluoride, Iron, Lead, Manganese and TDS in Groundwater: The cause of the exceedences in groundwater is not known, but could be due to background groundwater quality and/or discharge from the tailings or heap leach facilities or dewatering water. Because the waste rock was shown to have a significant potential to leach contaminants, the fact that there is relatively little groundwater contamination indicates the mitigation may be working. However, there are trends that cannot be explained by assuming that all exceedences are background. Fluoride is the biggest issue especially since it is a constituent of concern for leaching from the waste rock. It suggests that the baseline water quality was not adequately determined.

Table 6.27. Round Mountain, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings, heap leach offload, or baseline conditions.	Test results suggest some exceedences could occur if water were to seep through leach offload piles, discharge directly to a protected groundwater aquifer. MWMP tests show exceedences of over 10 times for arsenic, and less than 10 times for antimony, selenium and cyanide. pH is also higher than allowed. If, after cessation of mine operations, seepage of tailings is still occurring through underdrain, seepage would create potential impact to groundwater.	Tailings facility designed for zero discharge. Backfill and reclaim the tailings seepage collection pond after underdrain seepage has ceased.	No discharge from pit, so no impact to GW. Significant impacts to ground water quality from leach offload piles not anticipated due to attenuation in soils. Minimal impact to ground water quality from tailings facilities due to management, design. Any metals or cyanide mobilized by snowmelt or rainfall that runs off piles/seeps through piles and infiltrates alluvial soils would be attenuated in upper soil column.	Exceedences of secondary standards for aluminum, fluoride, iron, manganese, pH (high) and TDS and primary drinking water standards for arsenic, antimony, and lead all appear to be related to baseline conditions. No mining-related exceedences are evident.

6.3.23. RUBY HILL, NEVADA

The Ruby Hill Mine, owned by Barrick Goldstrike since its acquisition from Homestake, has been in operation since 1997. Mining ceased and reclamation commenced in 2002, although processing of gold and silver from its cyanide heap leaches continues to this day. It disturbs 696 acres on private lands. It has a current financial assurance amount of $7.1 million. The mine issued a DEIS to reopen and expand its operations in 2005.

6.3.23.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EIS was completed in 1997. The following sections summarize the water quality predictions made in the NEPA documents reviewed.

1997 EIS

The ore is oxide and hosted in limestone, with some sulfides present. The following predictive tests were performed: whole rock analysis static ABA, MWMP, humidity cell and synthetic precipitation leach procedure (EPA method 1312). The average ANP:AGP was 813 for alluvial material and 955 for oxidized limestone samples; the potential for acid generation was considered low. Leach tests indicated there was a moderate potential for contaminant/metals leaching; meteoric water mobility procedure (MWMP) results from alluvial material and oxidized limestone showed occasional drinking water exceedences for aluminum, arsenic, antimony and TDS. EPA method 1312 leach tests showed exceedences for aluminum, arsenic and pH (high).

Modeling indicated low potential for groundwater degradation. Increased erosion was the only noted surface water quality concern. No impacts to surface or ground water were predicted, due to the nature of the rocks, as well as the distance to water. The pit bottom will be above the regional water table, so no pit lake was expected.

6.3.23.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring and compliance data were obtained from the Nevada Department of Environmental Protection (NDEP) for the period 1997-2003, and the 2005 DEIS also summarizes water quality at the site. Nine groundwater monitoring locations were noted for the site.

Only two constituents had substantially high concentrations: arsenic and nitrate. Two wells had high arsenic concentrations, often exceeding MCL values by two to four times; concentrations increased by about 20% between 1996 and 2003. However, the highest concentration occurred upgradient of the mine. Elevated pH values were also common in groundwater wells. Nitrate concentrations frequently approached the MCL in several wells. The 2005 EIS suggested these predated the mine and were due to septic systems.

There were lead exceedences (less than twice the drinking water standard) during the fourth quarter of 1997 and the first quarter of 1998 in monitoring well MW-4, although no problems were recorded after this point. Since the exceedences did not recur, it did not result in any action by NDEP.

6.3.23.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.28 provides a summary and comparison of potential, predicted and actual water quality information for the Ruby Hill Mine. The accuracy of the predictions is discussed in this section.

Table 6.28 Ruby Hill, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impact
Groundwater	Baseline conditions.	Low potential for degradation from leaching of Arsenic and Aluminum, according to the Horizontal Plane Source Model. Partial backfilling of pit (preferred alternative) would increase potential chemical impacts.	Zero discharge heap leach with a leakage detection/collection system; rinsing of heap leach during closure followed by a land application of rinse water.	Contamination of groundwater by leach solution not expected. Cumulative impacts from the waste rock and leach residue are not expected to occur.	None. Any exceedences appear to be related to baseline conditions.

Water quality impacts were not expected and did not occur. Therefore, assuming that the exceedences are related to baseline conditions, the water quality predictions were accurate.

6.3.24. TWIN CREEKS, NEVADA

The Twin Creeks Mine, owned by Newmont Mining Corporation since its acquisition from Santa Fe Mining, is the combination of the Rabbit Creek and Chimney Creek mines, which began operating in around 1988. The primary commodities mined are gold and silver from open pit mining and heap leach, vat leach, and oxide milling processing operations. It disturbs 4,549 acres on private land and 8,898 acres on BLM lands for a total disturbance of 13,447 acres. The current financial assurance amount is not known.

6.3.24.1. WATER QUALITY PREDICTIONS SUMMARY

Initially, the two mines, Chimney Creek and Rabbit Creek, were permitted with EAs. In 1996 an EIS was conducted for a mine expansion, which included combining the two existing mines. The following section summarizes the geochemical characterization, hydrologic analysis and predictions and water quality predictions made in the 1996 EIS.

1996 EIS

Arsenic-mercury mineralization occurs mostly in oxidized ore, but there is some sulfide ore in the South Pit deposit. Sulfide minerals associated with gold mineralization include pyrite, stibnite, realgar and orpiment. Sulfide ore from the Mule Canyon Mine will also be processed at the Twin Creeks Mine.

Waste rock and pit wall rock were analyzed with static (ABA), kinetic (20-wk humidity cell; 46 pit wall rock samples), mineralogy, and short-term leach tests (MWMP). Hydrologic modeling included MINEDW (proprietary) for groundwater dewatering. Mass balance modeling was used to predict the final pit lake elevation. CE-THERM-R1 was used to predict pit evaporation. DE-QUAL-W2 was used for modeling limnologic processes. Geochemical modeling included MINTEQA2 for predicting pit water chemistry and the Davis-Ritchie model for predicting the thickness of the oxidized zone in the pit walls over time.

Based on MWMP leachate results for waste rock, pit wall rock and tailings, and on humidity cell tests for pit wall rock, total dissolved solids, aluminum, antimony, arsenic, beryllium, cadmium, chloride, chromium, copper, iron, lead, manganese, mercury, nickel, nitrate, selenium, silver, sulfate, thallium and zinc were the constituents of concern. Waste rock (based on MWMP tests) leachate could exceed drinking water standards for total dissolved solids, beryllium, cadmium, selenium, zinc (all by 1 – 10 times), and for aluminum, antimony, arsenic, iron, manganese, mercury, nickel, sulfate and thallium (all by >10 times).

The acid generating potential of pit wall rock ranged from a net neutralizing potential (NNP) of -350 to +671t/kt, with an average of +162 t/kt (average is non acid generating). The majority (91%) of rocks in the proposed final pit surface were predicted to not be acid generating. Of the waste rock, approximately 9% was predicted to be potentially acid generating. Heap leach ore was apparently not tested, but sulfide ore had a NNP weighted average of -67 t/kt (acid generating). Juniper and Sage mill tailings were net acid neutralizing; Mule Canyon Mine ore, which is milled at Twin Creeks, was potentially acid generating. Tailings MWMP leachate concentrations exceeded drinking water standards for arsenic, antimony, cadmium, chromium, copper, iron, lead, mercury, silver, and selenium; tailings filtrate had elevated concentrations of zinc and chloride.

Infiltrating dewatering water was identified as having the potential to flush soluble salts, including chloride and nitrate, from the shallow alluvium to groundwater. The water also contained elevated concentrations of antimony, but observations prior to the DEIS indicate the alluvium could attenuate it. No significant impacts to groundwater quality were expected from the sulfide ore stockpiles or tailings due to low precipitation, groundwater depth and natural attenuation. The surface water in Rabbit Creek could be affected by the discharge of dewatering water, which has shown occasional exceedences of total dissolved solids (by 1-10 times) and arsenic (by >10 times). Testing showed that the pit lake could have water quality problems in both the short term and long term.

The DEIS proposed numerous mitigation; some were presented as design criteria and others were actual plans for monitoring and mitigation. Some waste rock would be placed over tailings, and thus seepage would be collected and discharged to process facilities, evaporated, or treated prior to discharge. Most waste rock dumps would be constructed on top of alluvium with net neutralizing potential and more than 100 feet to the groundwater after the dewatering drawdown recovers. A basal layer of acid neutralizing material would be placed underneath acid generating waste rock. Tailings facilities would be designed with liners, subdrains, collection ponds and pumpback systems to prevent migration of tailings waters into groundwater. Groundwater would be monitored to detect infiltration of mine water, with mitigation measures to follow if infiltration is detected. Heap leach pads would be designed with synthetic liner and leak detection system and operated as a zero-discharge facility; solution ponds were

planned to be double-lined with leak detection systems. A bioremediation facility was proposed to treat hydrocarbon-contaminated soil.

For surface water discharge and discharge to the infiltration basin, treatment was proposed for dewatering water to remove arsenic. The connection between Jake Creek and the regional groundwater system will be evaluated, followed by monitoring for water quantity and quality. Diversion structures will be inspected to ensure proper function and combat soil loss. Drainage structures will be stabilized after completion of mining. The pit lake water quality will be monitored, but there was no plan identified to mitigate problems.

Mine dewatering would lower the regional groundwater elevation, but re-infiltration would increase water levels in the reinfiltration pond area by up to 70 feet, even though stream flow increase was not expected. Drawdown would potentially reduce baseflow in perennial streams and springs, including Little Humboldt River and Jake Creek. Pit water was not expected to discharge to groundwater, so no impacts to downgradient groundwater were expected.

Tailings facilities would be designed to be zero discharge to prevent migration of tailings waters into groundwater systems. Potential for adverse effects to water quality from sludge disposal was considered minimal. Limited or no impact was expected to occur from bioremediation facilities. Modeling showed that drinking water standards were predicted to be exceeded for antimony and arsenic (>10 times) and thallium (1 – 10 times) for the life of the pit. Aluminum concentrations were predicted to exceed standards in the north lobe of the pit for the first 27 years, but after the pit lakes merged, no exceedences were predicted. Steady state pit water quality would exceed TDS standards by 1-10 times. No net outflow from the pit to groundwater or surface water was expected.

Dewatering water discharged to Rabbit Creek has shown occasional exceedences of total dissolved solids and arsenic. However, the receiving water, Rabbit Creek, is dry and the flow will rarely reach Jake Creek, so downstream surface water quality impacts were predicted to be minimal. Discharge to infiltration basins was also expected to leach some salts into the underlying groundwater from the alluvium.

6.3.24.2. ACTUAL WATER QUALITY CONDITIONS

Water quality monitoring and compliance data were collected from the Nevada Department of Environmental Protection (NDEP) for the period 2000-2003. Seven groundwater monitoring locations were noted for the site. The following information on water quality was noted:

- Monitoring reports submitted show high arsenic concentrations in many wells. These reports refer to arsenic levels as background. However, the concentrations fluctuated by as much as two-fold, and the wells are screened in shallow alluvium. Some wells are located near the tailings impoundments. Therefore, the claim that arsenic concentrations are baseline requires further analysis.
- Cyanide was detected in monitoring well MW-2 in October 1995, from seepage in the Pinon tailings impoundment. Seepage is believed to have occurred when the supernatant pool was filled too deeply, which may have resulted in seepage through the tailings embankment in excess of the collection pipe's capacity. Due to ongoing exceedences, there may be an ongoing leak. NDEP evaluated and characterized seepage fluids in the vadose zone below the facility and plugged well MW-2 because they believed it was acting as a conduit. The well was replaced with monitoring well MW-2R-1. Vadose zone wells (VW wells) were added to monitor seepage from the tailings impoundment. Vadose zone monitoring wells were added during 2003 to monitor seepage from the tailings impoundment (VW-1 through VW-26), and water quality in these wells is of poorer quality with multiple exceedences of TDS, sulfate, chloride, cyanide, aluminum, antimony, arsenic, manganese, iron and mercury. With possible exception of arsenic, it does not appear that tailings water regularly reaches the pre-existing alluvial groundwater.

6.3.24.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.29 provides a summary and comparison of potential, predicted and actual water quality information for the Twin Creeks Mine. The accuracy of the predictions is discussed in this section.

Table 6.29. Twin Creeks, NV, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impacts	Mitigation	Predicted Impacts	Actual Impacts
Groundwater	Tailings impound ment	Infiltrating dewatering water could flush soluble salts, including chloride and nitrate, from shallow alluvium to groundwater. Low potential for impacts from heap leach. No significant impacts from sulfide ore stockpiles or tailings.	Layer of acid-neutralizing material underneath overburden storage. Overburden placed over tailings, seepage collected and discharged to process facilities, evaporated, or treated prior to discharge. Tailings facilities have liners, subdrains, collection ponds, and pumpback systems. Heap leach pads have liner and leak detection, as well as double lined solution ponds with leak detection. Monitoring.	Dewatering would lower groundwater elevation, infiltration would increase levels in reinfiltration pond area up to 70 feet; stream flow increase not expected. Pit water not expected to discharge to GW, so no impacts. Tailings facilities have liners, subdrains, collection ponds, and pumpback systems.	The Pinon tailings impoundment formed a leak which caused a perched zone with poor water quality including high concentrations of WAD cyanide, arsenic, TDS and other constituents.
Surface Water	Dewater-ing water	Drawdown would potentially reduce baseflow in perennial streams and springs, including Little Humboldt River and Jake Creek.	Evaluation of connection between Jake Creek and groundwater system, followed by monitoring. Inspection of diversion structures to ensure function and combat soil loss. Stabilization of drainage structures after mining.	Potential for impacts from sludge disposal is considered minimal. Limited/no impact expected from bioremediation facilities.	Water discharged to Rabbit Creek has shown occasional exceedences (by 1-10 times) of total dissolved solids and arsenic (over 10 times).

Leakage of Cyanide from Tailings Impoundment to Groundwater: Geochemical testing showed that seepage from the tailings impoundment could degrade groundwater if the mitigation failed. The high concentrations of the vadose zone wells show that failure did occur. Therefore, the predictions that groundwater would not be degraded due to the zero discharge design were incorrect.

Elevated Arsenic Concentrations in Groundwater: There are questions about the baseline occurrence of arsenic in some of the wells. Because of their location and the variability of the concentrations, it cannot be determined whether the baseline condition, assumed by regulators, is correct. For this reason, it appears the characterization of the baseline water quality was insufficient.

6.3.25. FLAMBEAU, WISCONSIN

The Flambeau Mine, owned by Kennecott, was in operation from 1991 to 1995. The primary commodities mined were lead and zinc from open pit mining and flotation processing operations.

6.3.25.1. WATER QUALITY PREDICTIONS SUMMARY

NEPA was required for the new project to be permitted, and an EIS was completed in 1990. The following sections summarize the water quality predictions made in the NEPA document reviewed.

1990 EIS

Dominant rock types within the mineralized horizon are quartz-rich sediments and volcanic ash, massive sulfide, semi-massive sulfide, and chert. Economically valuable minerals are chalcocite, bornite and chalcopyrite, with trace amounts of gold and silver. The upper gossan cap is 30 feet thick. High-grade supergene copper (chalcocite, bornite in pyrite/chert) extends from below the gossan cap to a maximum depth of 225 feet. Lower grade copper sulfide minerals are present below the supergene-enriched zone.

Geochemical testing and modeling were conducted as part of the EIS. Wet/dry leach test (possibly humidity cell tests) and a second leach test of continued saturation of materials were conducted. Whole rock analysis and sulfur analysis were performed on waste rock (5 samples), topsoil, till, sandstone and saprolite samples. Acid production tests were performed on waste rock. Based on the results from leach tests and geochemical modeling, iron, manganese and sulfate were identified as constituents of concern. A geochemical model was used to predict the composition of leachate in the open pit backfill.

Acid drainage potential tests indicated that waste rock with a sulfur content of 2% or less would not be expected to produce acid. The matrix of the enriched horizon was made up of pyrite and chert. There was no indication of the amount of high sulfur material. Leach tests identified the potential for elevated concentrations of copper, iron, manganese and sulfate in interstitial waters in the backfilled pit. Waste rock from the mining operation would have the potential to leach contaminants to groundwater and surface water.

The EIS identified a number of proposed mitigation. High sulfur waste stockpiles and ore crushing/loading areas would be lined to prevent seepage. In the worst case scenario, leakage would leak into mine pit, where water would be treated before discharge. Settling ponds will collect runoff from low sulfur waste stockpiles for treatment prior to discharge to the Flambeau River. The ponds are proposed to be unlined, but seepage to groundwater would flow mostly to the open pit. Backfilling will eliminate the possibility of a pit lake, and the backfill will be limed. Water from the open pit, and the high sulfur waste rock pile would be routed through the wastewater treatment plant before being discharged to the Flambeau River.

The EIS identified a number of predicted impacts to groundwater, surface water and pit water. Slightly increased levels of TDS, hardness, sulfate, iron and manganese might be expected from leachate infiltration to groundwater. Contaminants would flow into the adjacent mine pit, where water would be treated prior to discharge to the Flambeau River. High sulfur waste stockpile, ore crushing and loading areas would be lined using a geomembrane; therefore, no impacts to groundwater quality were expected. Settling ponds would collect runoff from low sulfur waste stockpiles and seep into groundwater at a rate of at least 5,000-6,000 gallons/day; this could cause an increase in contaminant concentrations in the groundwater near the ponds. Most groundwater under the ponds would flow into the pit, limiting the potential zone of contamination. Surface water impacts could include increased soil erosion and discharge of sediment (increased turbidity) to the river. Discharge into the Flambeau River will not cause the concentration of any substances in the river to exceed the most stringent applicable water quality standards. The groundwater drawdown may affect additional acreage. A small amount of contaminants from the settling ponds may be transported in the groundwater to the Flambeau River but would not measurably affect the river water quality. After closure, discharge of contaminants would not likely be measurable in the Flambeau River due to dilution by the

large river flow. Pit backfilling will eliminate pit waters. Modeled leachate concentrations in pit backfill were predicted to be 0.014 mg/l copper, 0.32 mg/l iron, 0.725 mg/l manganese, and 1,360 mg/l sulfate.

6.3.25.2. ACTUAL WATER QUALITY CONDITIONS

Monitoring and compliance data for the period 2000-2003 were obtained from the 2003 Annual Report, Groundwater and Surface Water Trends (Flambeau Mining Company, January 1, 2004). One surface water monitoring location and four groundwater monitoring locations were noted. The following water quality data was noted.

Four monitoring wells in the backfilled pit showed exceedences of drinking water MCLs or secondary standards for iron (up to 12 mg/l), manganese (up to 37 mg/l), pH (as low as 6.1), sulfate (up to 1,700 mg/l) and total dissolved solids (up to 3,400 mg/l). One in-pit well showed continued increasing or elevated concentrations of iron, sulfate, TDS and manganese; other wells showed decreasing concentrations. Groundwater elevations were higher in the backfilled pit than they were between the pit and the river, so water potentially flows from the pit to the river. After groundwater elevations returned to pre-mining levels, concentrations of iron, manganese, sulfate and TDS increased and pH decreased. Values for pH before pumping began were quite variable (5.8 - ~8.3). Concentrations appeared to peak in 2000 and were slowly decreasing for manganese (from a high of over 5,000 µg/l), sulfate (from a high of almost 700 mg/l) and TDS (from a high of ~1,300 mg/l), but are continuing to increase for iron (up to ~6 mg/l). Zinc concentrations were variable and still (as of 2003) ~700 µg/l (Lehrke, 2004).

Although concentrations in surface water up and downgradient of the mine showed no temporal water quality trends, a report from the Great Lakes Indian Fish and Wildlife Commission stated that water parameters measured have changed from those measured during mine operation, and that the change makes it impossible to compare during- and post-mining water quality (Coleman, 2004). In addition, the report states that the downstream sample site SW-2 is above the discharge point for surface water coming from the southeast portion of the mine site and therefore may not capture all releases from the mine.

6.3.25.3. COMPARISON OF PREDICTED AND ACTUAL WATER QUALITY

Table 6.31 provides a summary and comparison of potential, predicted and actual water quality information for the Flambeau Mine. The accuracy of the predictions is discussed in this section.

Elevated Concentrations of Iron, Manganese, Sulfate, TDS and Acidity in Pit Backfill Leachate: The concentrations of copper, iron, manganese and sulfate in the backfilled pit were predicted using geochemical modeling in the 1900 EIS. The modeling apparently used concentrations from short-term leach tests, but the details of modeling were not provided in the EIS. Predictions were also made in 1996 and 1997 as part of the mine's backfill plan. Concentrations predicted in 1997 for copper, manganese, and iron were substantially higher than those predicted in the EIS. For example, copper concentrations predicted in 1997 were 0.18 to 0.56 mg/l, and concentrations in the EIS were 0.014 mg/l. Compared to EIS-predicted post-mining concentrations in the pit backfill, post-mining concentrations in the backfill were higher by up to 45 times for copper, 70 times for manganese, 30 times for iron, and 1.25 times for sulfate. Therefore, modeling underestimated actual concentrations of metals and other contaminants in the pit backfill leachate.

Table 6.31. Flambeau, WI, Potential, Predicted and Actual Impacts

Resource	Source	Potential Impact	Mitigation	Predicted Impact	Actual Impact
Pit Backfill Leachate	Pit backfill	Pit backfill will eliminate pit waters.	Backfilling to eliminate possibility of a pit lake. Liming of backfill.	Pit backfill will eliminate pit waters. Predicted leachate concentration in pit backfill was 0.014 mg/l copper, 0.32 mg/l iron, 0.725 mg/l manganese and 1,360 mg/l sulfate.	Four monitoring wells in the backfilled pit show exceedences of drinking water standards for iron, manganese, pH, sulfate and TDS. One in-pit well shows continued increasing or elevated concentrations of iron, sulfate, TDS and manganese; other wells show decreasing concentrations.
Groundwater	Pit backfill	Waste rock from the mining operation would have the potential to leach contaminants to ground water.	High sulfur waste stockpiles and ore crushing/ loading areas lined. Treatment of mine water before discharge; Liming of backfill. Settling ponds to collect runoff from low sulfur stockpiles.	Slightly increased TDS, hardness, sulfate, iron and manganese may be expected from leachate infiltration. No impacts from high sulfur stockpile, ore crushing areas. Worst-case leakage would leak into mine pit, where water would be treated before discharge. Groundwater under ponds flows to pit, limiting contamination.	Samples taken from a well between the river and the pit show exceedences of drinking water standards for iron (2.8-7.4 mg/l), manganese (3.1-4.2 mg/l), pH (5.9-6.2), sulfate (250-460 mg/l), and TDS (810-1,100 mg/l).
Surface Water and Springs	Pit backfill and mine operations	Waste rock from the mining operation would have the potential to leach contaminants to surface waters.	Settling ponds collect runoff from low sulfur stockpiles for treatment prior to discharge. Ponds unlined, but seepage to groundwater would flow mostly to pit. Contaminant flow to pit treated prior to discharge to river.	Increased erosion and discharge to river possible. Discharge will not cause concentration of any substance to exceed standards. Contaminants from ponds may be transported to river, wouldn't affect water quality. Post-closure discharge of contaminants not measurable in river due to dilution.	No observable changes in surface water quality, but sample locations may not capture all releases from mine.

7. SUMMARY OF CASE STUDY FINDINGS AND INHERENT FACTORS AFFECTING OPERATIONAL WATER QUALITY

Section 7 presents a general summary of predicted and actual water quality for the 25 case study mines. To determine the accuracy of water quality predictions, statements made in the NEPA documents about potential and predicted water quality impacts were compared with actual operational water quality data, using information from Section 6. Water quality impacts from acid drainage and other contaminants may be delayed, depending on the amount and availability of neutralizing and acid-generating material, the distance to water resources, and other factors (Maest et al., 2005). Because mines that have not had water quality impacts to date may have impacts in the future, a greater emphasis is placed in this report on comparing predictions for mines that have already had water quality impacts.

"Inherent" factors affecting operational water quality at the case study mines are also identified and discussed. The potential inherent factors identified in the EISs that can affect water quality at mine sites include geology and mineralization, acid drainage and contaminant leaching potential, climate and proximity to water resources. If a strong relationship exists between certain of these factors and operational water quality for the case study mines, it may be possible to estimate in advance – knowing only what can be gathered from EISs – which mines may have better and worse environmental performance.

Section 7.1 presents the general findings on the accuracy of water quality predictions in the EISs and EAs. Section 7.2 presents information on the relationship between inherent characteristics (or combinations of characteristics) and actual water quality at the case study mines. Although predictions from all EISs for a given mine were considered, the initial predictions (i.e., in the first EIS or EA) are often the most important, because, with the exception of separate expansions, the major mitigating measures are based on these initial predictions. Although sample sizes are not large enough for statically valid comparisons, general statistical measures (simple percentages for a population with a given characteristic) are presented to indicate the importance of the associations discussed.

7.1. ACCURACY OF WATER QUALITY PREDICTIONS: SUMMARY OF CASE STUDY FINDINGS

Findings for individual case study mines are presented in Section 6. In Section 7.1, predicted and actual water quality data are reviewed for all 25 case study mines to determine if there are patterns in the accuracy of EIS water quality predictions.

7.1.1. ACID DRAINAGE/CONTAMINANT LEACHING POTENTIAL AND DEVELOPMENT

The potential for acid drainage is usually determined using static acid-base accounting tests, while the potential for contaminant leaching is usually determined using the results from short-term leach tests and analysis of the leachate for metal concentrations. Kinetic test results can be used to determine both acid drainage and contaminant leaching potential. It is possible to have neutral or even basic drainage and elevated contaminant concentrations, especially for constituents such as arsenic and other oxyanions, cyanide, and anions such as nitrate and sulfate. Therefore, these two geochemical characteristics (acid drainage and contaminant leaching) are discussed separately.

The results for acid drainage and contaminant leaching potential and development are contained in Tables 7.1, 7.2 and 7.3. The majority of the case study mines (18/25 or 72%) predicted low potential for acid drainage in one or more EIS. Of the 25 case study mines, 36% have developed acid drainage on site to date. Of these nine mines, eight (89%) predicted low acid drainage potential initially or had no information on acid drainage potential. The Greens Creek Mine in Alaska initially predicted moderate acid drainage potential but later predicted low potential for acid drainage for an additional waste rock disposal facility. Therefore, nearly all the mines that developed acid drainage either underestimated or ignored the potential for acid drainage in their EISs.

Table 7.1. EIS and Operational Water Quality Information for Case Study Mines

Site	State	Highest (Lowest) Acid Drainage Potential	Acid Drainage Developed on Site?	Contaminant Leaching Potential	Standards Exceeded in SW?	Constituent Increasing or Exceeding in SW	Standards Exceeded in GW?	Constituents Increasing or Exceeding in GW or Seeps
Greens Creek	AK	Moderate (Low)	Yes	Low	Yes	low pH, Cd, Cu, Hg, Zn, SO_4	No	GW: SO_4; seeps: SO_4, Zn, pH, Cu, Pb, Se
Bagdad	AZ	Low	Yes	No info	Yes	As, Pb, Hg, Se	No info	NA
Ray	AZ	No info	Yes	No info	Yes	TDS, NH_3, As, Be, Cu, turbidity	No info	NA
American Girl	CA	Low (0 initial)	No	Low (No info initial)	No	None	No	None
Castle Mountain	CA	Low	No	Low	No	None	No	None
Jamestown	CA	Low	No	Low	No info	NA	Yes	SO_4, NO_3, As
McLaughlin	CA	Low	Yes	Moderate	Yes	SO_4, As, Cr, Cu, Pb, Mn, Ni, Hg, Fe, Zn	Yes	TDS, Cl, NO_3, SO_4, Cu, Fe, Mn, B, Zn
Mesquite	CA	Low	No	Low (No info initial)	No	None	No	None
Royal Mountain King	CA	Low	No	No info	Yes	NO_3, SO_4, TDS, As	Yes	Cl, NO_3, Ni, Se, SO_4, TDS, Mn, As, Sb, Cr, Cu, Ni, CN
Grouse Creek	ID	Moderate	No	Low	Yes	CN	Yes	GW: CN; Tail pore water: Al, Cu, As, Se, Ag, Zn, CN
Thompson Creek	ID	Moderate (Low initial)	Yes	Low	Yes	Cd, Cu, Pb, Zn, SO_4	No info	Seeps: Fe, Zn, SO_4, Se; GW: NA
Beal Mountain	MT	Moderate (Low initial)	No	Low	Yes	NO_3, TDS, SO_4, CN	Yes	GW: NO_3, Fe, CN; TDS. Seeps: CN, Se, SO_4, NO_3
Black Pine	MT	High (no info initial)	Yes	Moderate	Yes	SO_4, Cu, Zn, Fe, Cd, low pH	No info	Seeps: low pH, SO_4, Cu, Zn, Fe, Cd; GW: NA

Table 7.1. EIS and Operational Water Quality Information for Case Study Mines (continued)

Site	State	Highest (Lowest) Acid Drainage Potential	Acid Drainage Developed on Site?	Contaminant Leaching Potential	Standards Exceeded in SW?	Constituent Increasing or Exceeding in SW	Standards Exceeded in GW?	Constituents Increasing or Exceeding in GW or Seeps
Golden Sunlight	MT	High (Low initial)	Yes	High	No	NA	Yes	CN, Cu, low pH
Mineral Hill	MT	Low	No	Moderate	Yes	CN, NO_3, Mn, SO_4, As, TDS	Yes	CN, NO_3, Mn, SO_4, As, TDS
Stillwater	MT	Low	No	Moderate	No	NO_3	No	Adit: Cd, Cu, Pb, Mn, Zn, NO_3. GW: Cr, Fe, SO_4, Cl, PO_4, Cd, Zn
Zortman and Landusky	MT	High (Low initial)	Yes	Moderate	Yes	metals, metalloids, NO_3, low pH, CN	Yes	low pH, As, metals, NO_3, CN
Florida Canyon	NV	Low	No	Moderate	No	NA	Yes	CN, Hg, NO_3, Cl, TDS
Jerritt Canyon	NV	Moderate	No	Moderate	Yes	TDS, SO_4	Yes	CN, Cl, TDS, SO_4
Lone Tree	NV	Moderate	No	High	Yes	pH, TDS, F, B, NH_3	Yes (baseline?)	F, Fe, Mn, TDS, Al, B, NH_4, pH
Rochester	NV	Moderate (Low initial)	No	Moderate	Yes	NO_3, As	Yes	CN, Hg, Cd, NO_3, As
Round Mountain	NV	Low	No	High	No info	NA	Yes (baseline?)	Al F, Fe, Mn, TDS, Sb, Pb
Ruby Hill	NV	Low	No	Moderate	No info	NA	Yes (baseline?)	As, NO_3, Pb
Twin Creeks	NV	Moderate	No	High	Yes	TDS, As	Yes - perched GW	TDS, SO_4, Cl, CN, Al, Sb, As, Mg, Fe, Hg, Mn
Flambeau	WI	No info	Yes	Moderate	No	SO_4, Mn, low pH, Fe	Yes	Fe, Mn, pH, SO_4, TDS

No info = no information; NA = not applicable; Ag = silver; Al = aluminum; As = arsenic; B = boron; Be = beryllium; Cd = cadmium; Cl = chloride; CN = cyanide; Cr = chromium; Cu = copper; F = fluoride; Fe = iron; Hg = mercury; Mn = manganese; Ni = nickel; NO_3 = nitrate; NH_4 = ammonia; Pb = lead; Sb = antimony; Se = selenium; SO_4 = sulfate; TDS = total dissolved solids; Zn = zinc.

Table 7.2. Acid Drainage Potential Predictions and Results for Case Study Mines (Percentages)

Element	Number/Total	Percentage
Mines predicting low acid drainage potential	18/25	72%
Mines that have developed acid drainage	9/25	36%
Mines with acid drainage that predicted low acid drainage potential	8/9	89%

Table 7.3. Contaminant Leaching Potential Predictions and Results for Case Study Mines (Percentages)

Element	Number/Total	Percentage
Mines predicting low contaminant leaching potential	8/25	32%
Mines with mining-related exceedences in surface water or groundwater	19/25	76%
Mines with exceedences that predicted low contaminant leaching potential	8/19	42%
Mines with exceedences that predicted moderate contaminant leaching potential	8/19	42%
Mines with exceedences that predicted high contaminant leaching potential	3/19	16%

Eight case study mines predicted low contaminant leaching potential (Table 7.3). Of these eight mines, five (63%) had exceedences of standards in either surface water or groundwater or both after mining began. The three mines that predicted low contaminant leaching potential and had no exceedences of water quality standards were the three California desert mines: American Girl, Castle Mountain and Mesquite. Stated another way, 21 of the 25 case study mines (84%) had exceedences of water quality standards in either surface water or groundwater or both (Table 7.1). The exceedences at two of these mines may be related to baseline conditions. Of the remaining 19 mines, eight (42%) predicted low contaminant leaching potential (or had no information), eight (42%) predicted moderate contaminant leaching potential, and only three (16%) predicted high contaminant leaching potential. Therefore, nearly half of the mines that had exceedences of water quality standards underestimated or ignored the potential for contaminant leaching potential in EISs. The constituents that most often exceeded standards or that had increasing concentrations in groundwater or surface water included toxic heavy metals such as copper, cadmium, lead, mercury, nickel, or zinc (at 12/19 or 63% of case study mines), arsenic and sulfate (11/19, or 58% each), and cyanide (10/19, or 53%).

7.1.2. PREDICTED AND ACTUAL IMPACTS TO SURFACE WATER RESOURCES

Table 7.4 lists the case study mines, their potential and predicted surface water quality impacts from the EISs, and whether or not there were mining-related impacts or exceedences in surface water. The results in percentages are presented in Table 7.5. Sixty percent (15/25) of the case study mines had mining-related exceedences in surface water. One mine, (Stillwater Mine, MT) had mining-related increases of nitrate in surface water, but concentrations have not exceeded standards.

Table 7.4. Predicted and Actual Impacts and Proximity to Surface Water Resources at Case Study Mines

Site	State	Highest (Lowest) Potential Impact to SW	Highest Predicted Impact to SW	SW Impact?	Standards Exceeded in SW?	Perennial Streams or Discharge?
Greens Creek	AK	Low	Low	Yes	Yes	Both
Bagdad	AZ	Low	Low	Yes	Yes	Discharge
Ray	AZ	No info	No info	Yes	Yes	Discharge
American Girl	CA	Moderate (Low initial)	Low	No	No	No
Castle Mountain	CA	Low	Low	No	No	No
Jamestown	CA	Moderate	Low	No info	No info	Perennial
McLaughlin	CA	Moderate	Moderate	Yes	Yes	Discharge
Mesquite	CA	Moderate (Low)	Low	No	No	No
Royal Mountain King	CA	No info	No info	Yes	Yes	No info (Perennial); No discharge
Grouse Creek	ID	Moderate (Low initial)	Low (no info initial)	Yes	Yes	Perennial
Thompson Creek	ID	Moderate	Moderate (Low)	Yes	Yes	Both
Beal Mountain	MT	Moderate (no info initial)	Low	Yes	Yes	Both
Black Pine	MT	No info	Low	Yes	Yes	Perennial
Golden Sunlight	MT	Low	Low	No	No	No
Mineral Hill	MT	Low	Low	Yes	Yes	Both
Stillwater	MT	Low (no info initial)	Low	Yes	No	Discharge (unused)
Zortman and Landusky	MT	High (no info initial)	High (Low initial)	Yes	Yes	Both
Florida Canyon	NV	No info	Low	No	No	No
Jerritt Canyon	NV	Moderate	Low	Yes	Yes	Perennial
Lone Tree	NV	Moderate	Low	Yes	Yes	Discharge
Rochester	NV	Moderate	Low	Yes	Yes	No
Round Mountain	NV	Moderate	Low	No info	No info	No
Ruby Hill	NV	Low	Low	No info	No info	No
Twin Creeks	NV	High	Low	Yes	Yes	Both
Flambeau	WI	Moderate	Low	No	No	Discharge

Table 7.5. Predicted and Actual Impacts to Surface Water Resources at Case Study Mines (Percentages)

Element	Number/Total	Percentage
Mines with mining-related surface water exceedences	15/25	60
Mines with surface water exceedences predicting low impacts without mitigation	4/15	27%
Mines with surface water exceedences predicting low impacts with mitigation	11/15	73%

A little over one-third (nine or 36%) of the case study mines noted a low potential for surface water impacts. Ten (40%) of the case study mines noted a moderate potential, and one noted a high potential for surface water quality impacts in the absence of mitigating measures. Of the 15 mines with exceedences of standards in surface water, three (20%) noted a low potential (pre-mitigation), seven (47%) stated that there would be a moderate potential, two stated there would be a high potential, and three had no information in their EISs on surface water quality impact potential in the absence of mitigation (Table 7.4).

In terms of predicted (post-mitigation) surface water quality impacts, 73% (11/15) of the mines with surface water quality impacts predicted low water quality impacts in their initial EISs, two predicted moderate impacts, and two had no information on post-mitigation impacts to surface water resources (Table 7.5). Therefore, the predictions made about surface water quality impacts before the effects of mitigation were considered were more accurate than those made taking the effects of mitigation into account. Stated in another way, the ameliorating effect of mitigation on surface water quality was overestimated in the majority of the case study mines. No mine conducted field or laboratory studies to determine the effects of mitigation on water quality improvement; rather, the predictions for both surface water and groundwater quality appeared to be based on unstated assumptions or best professional judgment.

Of the mines with surface water quality exceedences, only one mine(McLaughlin, CA) was correct in predicting a moderate potential for surface water quality impacts with mitigation in place; the others predicted low potential (not exceeding standards) in at least one EIS. However, the McLaughlin Mine predicted low acid drainage potential, and acid drainage has developed on site. Of the mines without surface water quality exceedences (seven or 28%), all were correct thus far in predicting no impacts to surface water with mitigation in place. Three of the seven are desert mines in California, one (Stillwater, MT) has had increases in contaminant concentrations but no exceedences, and the other three have had no exceedences or increases in mining-related contaminant concentrations in surface water to date. Therefore, most case study mines predicted no impacts to surface water quality after mitigation are in place, but at the majority of these mines, impacts have already occurred.

7.1.3. PREDICTED AND ACTUAL IMPACTS TO GROUNDWATER RESOURCES

Table 7.6 lists the case study mines, their potential and predicted groundwater quality impacts from the EISs ,and whether or not there were mining-related impacts or exceedences in groundwater or seeps. The results in percentages are presented in Table 7.7. The majority (64%,or 16/25) of the case study mines had exceedences of water quality standards in groundwater. However, exceedences at three of the mines, all in Nevada, may be related to baseline conditions; therefore, 52% of the case study mines clearly had mining-related exceedences of standards in surface water. Exceedences at one mine (Twin Creeks, NV) were said to be in "perched" groundwater. One mine (Greens Creek, AK) had mining-related increases of sulfate in groundwater, but concentrations have not exceeded standards. No information on groundwater quality impacts was available for four mines; however, two of these mines had mining-related exceedences in seeps. There were drinking water exceedences in adit water at the Stillwater Mine in Montana.

Table 7.6. Predicted and Actual Impacts and Proximity to Groundwater Resources at Case Study Mines

Site	State	Highest (Lowest) GW Impact Potential	Highest (Lowest) Predicted GW Impact	GW Impacts?	Standards Exceeded in GW?	Mining-related Exceedences in Seeps?	Shallow Groundwater or Discharge?
Greens Creek	AK	Moderate (Low)	Low	Yes	No	Yes	Shallow
Bagdad	AZ	Low	Low	NA	NA	NA	Shallow
Ray	AZ	No info	No info	NA	NA	NA	No
American Girl	CA	Moderate	Low	No	No	No	Shallow
Castle Mountain	CA	Low	Low	No	No	No	No
Jamestown	CA	Moderate	Low	Yes	Yes	NA	Shallow
McLaughlin	CA	High	High	Yes	Yes	NA	Shallow
Mesquite	CA	Moderate (Low initial)	Low	No	No	No	No
Royal Mountain King	CA	Moderate	No info	Yes	Yes	NA	No info
Grouse Creek	ID	Moderate (Low initial)	Low (no info initial)	Yes	Yes	NA	Shallow
Thompson Creek	ID	Moderate	Moderate (Low)	NA	NA	Yes	Shallow
Beal Mountain	MT	Moderate (no info initial)	Low	Yes	Yes	Yes	Shallow
Black Pine	MT	No info	Low	NA	NA	Yes	Shallow
Golden Sunlight	MT	High (Moderate)	High (Low initial)	Yes	Yes	Yes	Shallow
Mineral Hill	MT	Moderate	Low (no info initial)	Yes	Yes	NA	No
Stillwater	MT	Low (no info initial)	Low	No	No	Yes - adit	Both
Zortman and Landusky	MT	Moderate (Low)	High (Low)	Yes	Yes	Yes	Shallow
Florida Canyon	NV	Moderate	Low	Yes	Yes	NA	Shallow
Jerritt Canyon	NV	Moderate (Low initial)	Low (no info initial)	Yes	Yes	NA	Shallow
Lone Tree	NV	Low	Low	No? (baseline?)	Yes (baseline?)	NA	Shallow
Rochester	NV	Moderate (no info initial)	Low	Yes	Yes	NA	Shallow
Round Mountain	NV	High	Low	No? (baseline?)	Yes (baseline?)	NA	No
Ruby Hill	NV	Low	Low	No? (baseline?)	Yes (baseline?)	NA	No
Twin Creeks	NV	Moderate	Low	Yes	Yes - perched GW	NA	Discharge
Flambeau	WI	Moderate	Low	Yes	Yes	NA	Shallow

Table 7.7. Predicted and Actual Impacts to Groundwater Resources at Case Study Mines (Percentages)

Element	Number/Total	Percentage
Mines with mining-related groundwater exceedences	13/25	52%
Mines with groundwater exceedences predicting low impacts without mitigation	2/13	15%
Mines with groundwater exceedences predicting low impacts with mitigation	10/13	77%

About one-third of the case study mines (eight or 32%) noted a low potential for groundwater quality impacts in the absence of mitigating measures (Table 7.7). Of the 13 mines with mining-related exceedences in groundwater, only two noted a low potential for groundwater quality impacts in the original EIS, the majority (nine or 69%) stated that there would be a moderate potential, and two stated there was a high potential for groundwater impacts in the absence of mitigation (Table 7.7). In terms of predicted (post-mitigation) groundwater quality impacts, most of the case study mines (10 or 80%) predicted low groundwater quality impacts (not exceeding standards) after mitigation were in place. And an even higher percentage (10 or 77%) of the mines with exceedences in groundwater predicted low water quality impacts in their EISs (including mines predicting low impacts in the original EIS). Therefore, as with surface water, the predictions made about groundwater quality impacts without considering the effects of mitigation were somewhat more accurate than those made taking the effects of mitigation into account. Again, the ameliorating effect of mitigation on groundwater quality was overestimated in the majority of the case study mines.

Of the mines with mining-related groundwater quality exceedences (13), only one mine – the McLaughlin Mine in California – was correct in predicting a high potential for groundwater quality impacts with mitigation in place. This is the same mine that correctly predicted that there would be surface water exceedences. The others predicted low potential (not exceeding standards) for groundwater quality impacts in at least one EIS. Of the mines without groundwater quality exceedences (five or 25%), all were correct in predicting no impacts to surface water with mitigation in place. Again, three of the five are desert mines in California, one (Stillwater MT) has had increases in contaminant concentrations but no exceedences, and the other (Greens Creek, AK) has had mining-related exceedences in seeps. Therefore, most mines predicted no impacts to groundwater quality after mitigation were in place, but in the majority of case study mines, impacts have occurred.

7.2. INHERENT FACTORS AFFECTING WATER QUALITY AT CASE STUDY MINES

One of the goals of this study was to determine if there are certain factors that make a mine more or less likely to have water quality problems and more or less likely to accurately predict future water quality. Such factors could include: inherent characteristics of the mined materials; inherent characteristics of the mine; management approaches to handling mined materials and water; the type and number of geochemical tests that are performed on mined materials; and the interpretation of test results.

There are two types of water quality predictions in EISs: "potential" water quality (does not take mitigation into account) and "predicted" water quality (does take mitigation into account). As noted in Section 7.1, nearly all the EISs reviewed reported that they expected acceptable water quality (concentrations lower than relevant standards) after mitigation were taken into account. Indeed, if this prediction was not made in the EIS, the regulatory agency would not be able to approve the mine (with certain exceptions, such as pit water quality in states where pit water is not considered a water of the state).

Certain inherent characteristics of the mined materials or mining locations may make the mine more or less susceptible to water quality impacts and more or less likely to have accurate predictions about future water quality. Some of the inherent characteristics that may influence a mine's environmental behavior include:

- ore type and association (e.g., commodity, sulfide vs. oxide ore, vein vs. disseminated)
- climate (e.g., amount and timing of precipitation, evaporation, temperature)
- proximity to water resources (distance to surface water resources, depth to groundwater resources, presence of springs)
- pre-existing water quality (baseline groundwater and surface water quality conditions)
- constituents of concern
- acid generation and neutralization potentials (and timing of their release), and
- contaminant generation potential.

In addition to the inherent characteristics of a mine and its location, the management of the mine and its wastes and waters, the processing chemicals used, and the type of operation (e.g., vat leach and tailings vs. heap leach facility; underground vs. surface mine) will have an important effect on a mine's environmental behavior. The management and mitigation measures used can be one of the root causes of water quality problems, and these issues are addressed in Section 8.

This section examines the inherent factors that can influence environmental behavior at mine sites. Information from the EISs presented in Section 5, was used to evaluate the inherent factors and the mitigation measured used, and information on operational water quality at the case study mines, presented in Section 6 was used to determine if the identified water quality potential was accurate.

For this evaluation, a water quality impact is defined as increases in concentration of water quality parameters as a result of mining operations, whether or not an exceedence of water quality standards or permit levels has occurred. Information on whether groundwater, seep or surface water concentrations exceeded standards as a result of mining activity is also included.

Information gathered from the EISs was used to categorize the inherent characteristics of the mine and its materials. All of the potential inherent factors listed above were listed in the database under NEPA information. The inherent factors evaluated include: geology and mineralization; proximity to water resources and climatic conditions; and geochemical characteristics of mined materials, such as acid drainage and contaminant leaching potential.

Mines with close proximity to water resources and moderate to high acid drainage or contaminant leaching potential are examined together to determine if this combination of inherent factors results in a higher risk of adverse water quality impacts. Results for case study mines with this combination of factors are included in Tables 7.1, 7.4 (surface water) and 7.6 (groundwater and seeps). The tables list: the acid drainage and contaminant leaching potential: the presence of surface water or groundwater impacts: the presence of acid drainage on site; exceedence of standards in surface water, groundwater or seeps; constituents that have increased in concentration over baseline conditions or exceeded standards; the presence of perennial streams or shallow groundwater on site; and the type of discharge to surface water or groundwater. The discharges to surface water are usually permitted National Pollution Discharge Elimination System (NPDES) discharges under the Clean Water Act. The tables also include information from the EISs on water quality predictions, including the potential (pre-mitigation) and predicted (post-mitigation) impact to water resources.

7.2.1. MINES WITH CLOSE PROXIMITY TO SURFACE WATER AND MODERATE TO HIGH ACID DRAINAGE OR CONTAMINANT LEACHING POTENTIAL

EIS and operational water quality information for mines with close proximity to surface water and elevated acid drainage or contaminant leaching potential is listed in Tables 7.1 and 7.4.

Mines with Moderate to High Acid Drainage Potential

The following case study mines have perennial streams on site or discharge directly to surface water and have a moderate to high acid drainage potential (see Table 7.1):

- Greens Creek, Alaska
- Grouse Creek, Idaho
- Thompson Creek, Idaho
- Beal Mountain, Montana
- Black Pine, Montana
- Zortman and Landusky, Montana
- Jerritt Canyon, Nevada
- Lone Tree, Nevada
- Twin Creeks, Nevada

Of these nine mines, all (100%) had mining-related exceedences of water quality standards in surface water. Of the nine mines with identified moderate to high acid drainage potential and close proximity to surface water resources, four (44%) have currently developed acid drainage on site. Impacts to surface water from the other five mines resulted from cyanide, nitrate, sulfate, metalloids, ammonia or other anions (Table 7.1).

At the Greens Creek Mine, elevated concentrations of sulfate and zinc and lower pH values were measured in smaller streams, most likely as a result of leaching of high sulfide material (tailings or waste rock) lying outside of the tailings pile capture area. At the Grouse Creek Mine, tailings impoundment leakage into groundwater resulted in cyanide in surface water. At the Thompson Creek Mine, creeks downgradient of the waste rock dumps had increasing concentrations of sulfate (to values in excess of water quality standards) over a six-year period. At the Beal Mountain Mine, nitrate, total dissolved solids, and sulfate concentrations in streams have increased relative to baseline conditions, and cyanide exceeded aquatic life standards. At the Black Pine Mine, springs impacted by waste rock flow into Smart Creek and have elevated concentrations of sulfate, copper, zinc, iron, and cadmium, and low pH values. At the Zortman and Landusky Mine, streams were impacted by acid drainage from waste rock and the heap leach pad. The Lone Tree Mine has been in general compliance with overall permit requirements for discharge of its dewatering water to the Humboldt River, but there were some exceedences of permit limits, and Newmont has been fined for these exceedences. Although no information was obtained on stream water quality at the Twin Creeks Mine, dewatering water discharged to Rabbit Creek has shown exceedences of total dissolved solids and arsenic standards by up to 10 times.

Each of these nine mines predicted low surface water impacts after mitigation were in place in at least one or all of the EISs (Table 7.4). For the Thompson Creek and Zortman and Landusky mines, later EISs predicted higher potential impact to surface water, but in both cases, the initial EIS predicted low impacts to surface water resources. In a number of cases, the mines expanded before the development of poor water quality conditions. These results suggest that even though mines may identify a moderate to high acid drainage potential, they predict that surface water resources will not be impacted after mitigation are implemented. In all cases where elevated acid drainage potential was identified, the predicted impact to surface water was identified as "low" in at least one EIS, yet impacts have occurred (see Tables 7.1 and 7.4).

Mines with Moderate to High Contaminant Leaching Potential

The following mines have perennial streams on site or discharge directly to surface water and identified a moderate to high potential for contaminant leaching in their EISs (see Table 7.1):

- McLaughlin, California
- Black Pine, Montana
- Mineral Hill, Montana
- Stillwater, Montana

- Zortman and Landusky, Montana
- Jerritt Canyon, Nevada
- Lone Tree, Nevada
- Twin Creeks, Nevada
- Flambeau, Wisconsin

Of these nine mines, five also have moderate to high acid drainage potential and proximity to surface water resources and were discussed above. With the exception of the Flambeau Mine, which has developed acid drainage on site, all nine mines have had some impact to surface water quality from mining operations, as shown in Table 7.1. For nine mines with proximity to surface water resources and moderate to high contaminant leaching potential, eight (89%) have shown some impact to surface water quality, and seven (78%) of the nine mines have had exceedences of standards in surface water.

Of the remaining four mines, the McLaughlin Mine has had exceedences of sulfate (showing steady increases since mining began, and occasionally large exceedences of arsenic, chromium, copper, lead, manganese, mercury, iron and zinc. However, no surface water quality violations were recorded for the McLaughlin Mine because of the way baseline water quality is calculated. At the Mineral Hill Mine, tailings leachate containing cyanide, nitrate, manganese, sulfate, arsenic, and dissolved solids has escaped the liner system and caused exceedences in surface water. The Stillwater Mine does not have perennial streams on site, but it does have a NPDES permit for discharge of mine water to surface water. However, this permit has never been used. Nitrate concentrations in the Stillwater River have increased to as high as 0.7 mg/l (site-specific limit is 1.0 mg/l) as a result of mining activity, but no standards or limits were exceeded. At the Flambeau Mine, there were no observable changes in surface water quality, but there is some concern that surface water sample locations may not capture all releases from mine. The Flambeau Mine has had groundwater impacts from the backfilled pit. More monitoring of additional locations over a longer time period is required to determine if observed poor groundwater quality will adversely affect downgradient surface water.

In terms of EIS predictions, six of the nine mines identified moderate to high potential for surface water impacts without mitigation, but eight of the nine predicted low impacts to surface water after mitigation were in place (as noted above, the Zortman and Landusky Mine initially predicted a low impact to surface water resources). To date, predictions for surface water impacts at the McLaughlin, Stillwater and Flambeau mines were accurate, but the remaining six mines underestimated the actual impact to surface water in their EISs.

Comparison to All Case Study Mines

Surface water impacts for the mines with close proximity to surface water and high acid drainage or contaminant leaching potential are compared to surface water impacts for all the case study mines in Table 7.8. Overall, for the 13 mines with close proximity to surface water and high acid drainage or contaminant leaching potential (see Table 7.1), 12 (92%) have had some impact to surface water as a result of mining activity (see Table 7.5). For all case study mines, only 64% had some surface water quality impact. Eleven of the 13 (85%) have had exceedences of standards or permit limits in surface water as a result of mining activity. These results, although not comprehensive, suggest that the combination of proximity to surface water resources (including direct discharges to surface water) and moderate to high potential for acid drainage does increase the risk of water quality impacts. Although this finding makes intuitive sense from a risk perspective, a comprehensive study of cause and effect has never been conducted.

Of the 11 with exceedences, 10 (91%) predicted that surface water standards would not be exceeded. Considering the two mines that accurately predicted no surface water exceedences (Stillwater and Flambeau) and the one that accurately predicted exceedences (McLaughlin), 77% of mines with close proximity to surface water or direct discharges to surface water and moderate to high acid drainage or contaminant leaching potential underestimated actual impacts to surface water. For all case study mines, 73% of the mines with surface water quality exceedences predicted that there would be no exceedences. Compared to all case study mines, higher percentages of mines with

close proximity to surface water and elevated acid drainage or contaminant leaching potential had surface water quality impacts and exceedences. EIS water quality predictions made before the ameliorating effects of mitigation were considered ("potential" water quality impacts) were more accurate at predicting operational water quality than predictions based on assumed improvements from mitigation. Mines with these inherent factors are the most likely to require perpetual treatment to reduce or eliminate the long-term adverse impacts to surface water resources.

Table 7.8. Surface Water Quality Impacts for Mines with Close Proximity to Surface Water and Elevated Acid Drainage Potential Compared to Surface Water Impacts for All Case Study Mines

	# Mines	Percent (%) with Impact to Surface Water	Percent (%) with Exceedences of Standards in Surface Water	Percent (%) with Exceedences that Predicted no Exceedences
Mines with close proximity to surface water and elevated acid drainage and contaminant leaching potential	13	92 (12/13)	85 (11/13)	91 10/11)
All case study mines	25	64 (16/25)	60 (15/25)	73 (11/15)

7.2.2. MINES WITH SHALLOW DEPTH OR DISCHARGES TO GROUNDWATER AND WITH MODERATE TO HIGH ACID DRAINAGE OR CONTAMINANT LEACHING POTENTIAL

The operational water quality of mines with shallow groundwater or discharges to groundwater resources – and with moderate to high acid drainage or contaminant leaching potential – is evaluated in this section. Mines with close proximity to groundwater resources are often close to surface water as well. Therefore, a number of mines evaluated above will also appear in this section. Mines that discharge to groundwater usually do so through infiltration basins or some other kind of land application. Although this is not a direct discharge to groundwater, it does increase the likelihood that the discharge water and any associated contaminants will reach groundwater. EIS and operational water quality information for mines with close proximity to groundwater and elevated acid drainage or contaminant leaching potential is listed in Tables 7.1 and 7.6.

Mines with Moderate to High Acid Drainage Potential

The following mines have a relatively shallow depth to groundwater (0 to 50 feet), have springs on site, or discharge to groundwater – and have a moderate to high acid drainage potential (see Table 7.1):

- Greens Creek, Alaska
- Grouse Creek, Idaho
- Thompson Creek, Idaho
- Beal Mountain, Montana
- Black Pine, Montana
- Golden Sunlight, Montana
- Zortman and Landusky, Montana
- Jerritt Canyon, Nevada
- Lone Tree, Nevada
- Rochester, Nevada
- Twin Creeks, Nevada

Of these 11 mines, some groundwater quality information was obtained for all but two (Thompson Creek, ID; Black Pine, MT). However, there is information about seepage water quality from both of these facilities. Of the 11 mines

with shallow depths to groundwater, springs on site or that discharge to groundwater and that have moderate to high acid drainage potential, 10 (91%) have had some impact to groundwater or seeps from mining operations (see Table 7.6). The one exception is the Lone Tree Mine, which has groundwater exceedences that may be related to baseline conditions.

The Greens Creek Mine in Alaska has a depth to groundwater that ranges from the ground surface up to 50 feet deep. Seepage/runoff from the waste rock piles has an average zinc concentration of 1.65 mg/l, and tailings seepage water (including underdrain water) has had pH values as low as 5.8, with elevated sulfate (up to 2,400 mg/l), zinc (up to 3.6 mg/l), copper, lead, and selenium concentrations. Anomalously high sulfate concentrations were observed in groundwater monitoring wells, but metal concentrations have not increased as of 2000.

The Grouse Creek Mine has springs and shallow groundwater (depths ranging from 0.5 ft in alluvial aquifers to 100 ft in upland areas). The tailings liner and French drains installed below the tailings impoundment were not successful in preventing contamination from tailings leachate, and cyanide has been detected in both surface water and groundwater monitoring stations. Some contamination of groundwater is still evident at the site.

No groundwater data were obtained for the Thompson Creek Mine, which has flowing artesian wells, alluvial groundwater that is connected to streams, and some groundwater in bedrock fractures. However, tailings seeps have shown increases in iron and zinc, and sulfate and selenium concentrations in waste rock seeps were increasing since 1991, with selenium concentrations in excess of water quality standards.

At the Beal Mountain Mine in Montana, there is limited information on groundwater depth, but there are springs on site, and groundwater depth below the pit is only 25 to 50 ft Groundwater in the land application area exceeded standards for nitrate, iron and cyanide and had elevated total dissolved solids concentrations. Springs below the land application area also show appreciable increases in cyanide and selenium. Concentrations of selenium, sulfate, nitrate and total dissolved solids were elevated in springs sampled at the toe of the waste rock dump.

At the Black Pine Mine in Montana, groundwater depths are approximately 45 feet in the impoundment area, and there are 30 springs in the project area. Although no direct information on groundwater quality was available, seeps downgradient of waste rock and the soils barren areas are acidic (pH 2.6-4.7) and have elevated concentrations of sulfate, copper, zinc, iron and cadmium.

The Golden Sunlight Mine has alluvial groundwater at 50 to 60 feet deep and numerous springs on site. Tailings effluent has contaminated downgradient wells with cyanide and copper (up to 65 mg/l copper). Acid drainage is being produced from the waste rock dumps, ore stockpiles, tailings and adits.

The Zortman and Landusky Mine in Montana has perched groundwater at 140 to 150 feet, an overall depth to groundwater of <200 feet, and springs and seeps on site. Karst features control groundwater flow in some areas. Acid drainage has been generated from waste rock dumps (as low as pH 3.9), the ore heap retaining dikes, pit walls and floors, and leach pads and pad foundations. Sulfate concentrations have increased in alluvial groundwater downgradient of the heap retaining dikes.

The Jerritt Canyon Mine has perched groundwater at eight to 70 feet deep, and 23 springs and eight seeps on site. The regional groundwater depth is approximately 700 feet. Groundwater has been impacted by seepage from the tailings impoundment, and a cyanide plume exists on site. Groundwater in the vicinity of the tailings area also has exceedences of chloride (up to 12,000 mg/l), TDS (up to 30,000 mg/l) and sulfate.

Groundwater at the Lone Tree Mine ranges from 10 to >200 feet deep. Pre-mining groundwater levels have scored the mine as being close to groundwater resources, but the large dewatering rate for this mine has lowered groundwater levels considerably. The Lone Tree Mine in Nevada has had exceedences of primary and secondary drinking water standards in groundwater, but it is not clear if the cause is baseline conditions or seepage from mine facilities.

Depth to groundwater at the Rochester Mine ranges from <1 to 20 feet in the alluvial aquifer and from the ground surface to approximately 400 feet in the bedrock aquifer. There are springs on site. Leaks from the heap leach pad and the barren solution pond have caused numerous exceedences of WAD cyanide, mercury, cadmium, nitrate and arsenic in groundwater.
The Twin Creeks Mine, which operates a large dewatering system, has a groundwater depth of over 100 feet over most of the mine site; the pit floor is approximately 400 feet below pre-mining groundwater levels. However, the mine discharges to groundwater through infiltration basins. Degradation of groundwater (perched water) with cyanide and other constituents has occurred as a result of seepage from the tailings impoundment. The vadose zone monitoring wells that were added during 2003 to monitor seepage from the tailings impoundment have shown multiple exceedences of total dissolved solids, sulfate, chloride, cyanide, aluminum, antimony, arsenic, iron, mercury and manganese.

Therefore, for the 11 case study mines with close proximity to groundwater resources or that discharge to groundwater and that have moderate to high acid drainage potential, eight (73%) have shown some adverse impact to groundwater quality from mining activity. Of the remaining three mines in this category, two have contaminated seeps flowing from tailings and/or waste rock storage areas (Thompson Creek, ID; Black Pine, MT), but no groundwater quality data were obtained, for a total of 10 mines (91%) with mining-related impacts to groundwater or seeps. One mine in this category (Lone Tree, NV) has had no groundwater impacts. However, the groundwater table at the Lone Tree Mine has been lowered considerably from dewatering operations, and it is unlikely that groundwater impacts would be evident at this time.

For the 11 case study mines with close proximity to groundwater and elevated acid drainage potential, seven (64%) had mining-related exceedences in groundwater. Of the remaining four mines, three had mining-related exceedences in seeps, and one (Lone Tree) has baseline exceedences. All 11 mines (100%) predicted low groundwater impacts in one or more EIS after mitigation were in place (Table 7.6), but three mines (Thompson Creek, ID; Golden Sunlight and Zortman and Landusky, MT) also predicted higher impacts in at least one EIS. Only four mines predicted low groundwater impacts without mitigation. Therefore, the predictions that considered the effects of mitigation on groundwater quality were overly optimistic, and the predictions without mitigation were more accurate.

Mines with Moderate to High Contaminant Leaching Potential

The following mines are have a relatively shallow depth to groundwater (0 to 50 feet), have springs on site, or discharge to groundwater – and have a moderate to high contaminant leaching potential (see Table 7.1):

- McLaughlin, California
- Black Pine, Montana
- Golden Sunlight, Montana
- Stillwater, Montana
- Zortman and Landusky, Montana
- Florida Canyon, Nevada
- Jerritt Canyon, Nevada
- Lone Tree, Nevada
- Rochester, Nevada
- Twin Creeks, Nevada
- Flambeau, Wisconsin

Of these 11 mines, all but four (McLaughlin, CA; Stillwater, MT; Florida Canyon, NV; Flambeau, WI) also have moderate to high acid drainage potential and were discussed above. As noted earlier, all of these seven mines have had some impact to groundwater or springs/seeps as a result of mining activity with the possible exception of the Lone Tree Mine in Nevada, which has exceedences in groundwater that may be related to baseline conditions. In addition, the originally shallow groundwater table at the Lone Tree Mine has been lowered considerably from dewatering operations, and it is unlikely that groundwater impacts would be evident at this time.

The McLaughlin Mine in California has been touted by the mining industry as an example of a mine with laudable environmental behavior and has received numerous environmental awards. When the state of Wisconsin passed a requirement for new mines in sulfide ore bodies to demonstrate that other mines with net acid generation potential have operated and been closed for at least 10 years without polluting groundwater or surface water (Wisconsin Act 171 {Statute §293.50}, passed in 1997), the McLaughlin Mine was one of the three examples used by Nicolet Minerals in their application for a permit for the Crandon Mine (Nicolet Minerals, 1998). The McLaughlin Mine has a regulatory exclusion for groundwater at the site, so no groundwater enforcement actions can be brought by Regional Water Quality Control Board (RWQCB). At the McLaughlin Mine, wells downgradient of the tailings impoundment had exceedences of TDS (up to 12,000 mg/l), chloride, nitrate (up to ~37 mg/l), and sulfate, and increases of copper (up to 280 µg/l) and other metals from 1984 – 1992 (mine began operation in 1985). Wells downgradient of waste rock dumps had increasing concentrations of sulfate (up to 5,000 mg/l), boron, TDS, calcium, iron, manganese and other constituents from 1985 to 1998 and zinc (up to 1.7 mg/l) after this timeframe.

The Stillwater Mine in Montana has also received environmental awards, and acid drainage has not developed on the site to date, likely due in part to the unique ultramafic host rock and associated mineralogy. Depth to groundwater at the mine is 40 to 90 feet, and there are three springs on site; the mine discharges adit water to percolation ponds and a land disposal area on the site. Groundwater at the Stillwater mine in the area of the East land application disposal area has exceeded drinking water standards for chromium, but the cause is tailings from an historic government-operated World War II- era mine. The adit water that percolates to groundwater is unimpacted, except for nitrogen contamination, but contains cadmium, copper, lead, manganese, zinc and nitrogen concentrations in excess of baseline surface water values. Groundwater downgradient of the land application facility has slight elevations of sulfate, chloride, phosphorous, cadmium, iron and zinc, but these appear to be a baseline issue.

The pre-mining regional groundwater table at the Florida Canyon Mine was quite deep (~400 feet), but alluvial groundwater exists at 0 to 250 feet deep. A contaminant plume with elevated concentrations or exceedences of WAD cyanide, mercury, nitrate, chloride, and TDS exists in groundwater downgradient from the leach pad. Other groundwater monitoring wells on the site show exceedences of drinking water standards for aluminum, arsenic, cadmium, chloride, iron, manganese, nickel and TDS.

Depth to groundwater at the Flambeau Mine is Wisconsin before mining began was generally <20 feet and flowed toward the Flambeau River. Samples taken from a well between the river and the backfilled open pit showed elevated levels (compared to baseline values) or exceedences of drinking water standards for iron, manganese, pH, sulfate, and total dissolved solids. Concentrations appeared to peak in 2000 and have been slowly decreasing for manganese, sulfate and TDS, but are continuing to increase for iron. Zinc concentrations are variable and still (as of 2003) ~700 µg/l (Lehrke, 2004).

Of the mines that have close proximity to groundwater, springs on site, or that discharge to groundwater – and have a moderate to high contaminant leaching potential – eight of 11 mines (73%) had groundwater quality impacts, and two of the remaining three had seeps that were adversely impacted from mining activity (91% have mining-related impacts to groundwater, seeps, springs, or adit water). The remaining mine (Lone Tree, NV) has had exceedences of primary and secondary drinking water standards in groundwater, but it is not clear whether the cause is baseline conditions or seepage from mine facilities. All of the 11 mines had exceedences of standards in groundwater (8), or seeps, springs, or adits (4).

Of the 11 mines in this category, all but one (McLaughlin, CA) predicted low groundwater quality impacts after mitigation were installed. The Stillwater Mine in Montana predicted low impacts to groundwater, and no exceedences of standard have thus far resulted from current operations or operators. The Lone Tree Mine in Nevada also predicted low groundwater impacts, and current information suggests that this is true (assuming the exceedences are a baseline issue). However, the lowered water table likely prevents the observation of impacts to groundwater. EIS water quality predictions made before the ameliorating effects of mitigation were considered ("potential" water quality impacts) were more accurate at predicting operational water quality than predictions based on assumed improvements

from mitigation. Therefore, of the 11 mines in this category, eight (73%) underestimated actual impacts to groundwater resources from mining activity.

Comparison to All Case Study Mines

Groundwater impacts for the mines with close proximity to groundwater and high acid drainage or contaminant leaching potential are compared to groundwater quality impacts for all the case study mines in Table 7.9. Taken as a whole, there are 15 mines with close proximity to groundwater, springs on site, or discharges to groundwater – and with moderate to high acid drainage or contaminant leaching potential (see Table 7.1 and 7.6). Of these 15 mines, 11 have had mining-related impacts to groundwater, and three have had adverse impacts to seeps, springs, or adit water (with the one possible exception being the Lone Tree Mine in Nevada), for a total of 14 (93%) with impacts to groundwater, seeps, or adit water. For all case study mines, only 14 (56%) had mining-related impacts to groundwater and three had mining-related impacts to seeps, for a total of 17 (68%) with impacts to groundwater, seeps or adit water.

Table 7.9. Groundwater Quality Impacts for Mines with Close Proximity to Groundwater and Elevated Acid Drainage Potential Compared to Groundwater Impacts for All Case Study Mines

	# Mines	Percent (%) with Impact to Groundwater or Seeps	Percent (%) with Exceedences of Standards in Groundwater or Seeps	Percent (%) with Exceedences that Predicted no Exceedences
Mines with close proximity to groundwater and elevated acid drainage and contaminant leaching potential	15	93 (14/15)	93 (14/15)	86 (12/14)
All case study mines	25	68 (17/25)	68 (17/25)	52 (13/25)

For the 15 mines with close proximity to groundwater and elevated acid drainage or contaminant leaching potential, 10 had mining-related exceedences in groundwater and four had mining-related exceedences in seeps or adit water, for a total of 14 (93%) with impacts to groundwater, seeps, or adit water. For all case study mines, 13 had mining-related exceedences in groundwater, and four more had exceedences in seeps or adit water, for a total of 17 (68%) with exceedences in groundwater, seeps, or adit water. Of the mines with groundwater, seep or adit water exceedences, 12 (86%) of those with close proximity to groundwater and high acid drainage or contaminant leaching potential predicted that there would be no exceedences (including those that predicted low potential in their initial EIS). For all case study mines with exceedences, 13 (52%) predicted that there would be no exceedences, including those that predicted low potential in their initial EIS. These results, although not comprehensive, suggest that the combination of proximity to groundwater resources (including discharges to groundwater) and moderate to high acid drainage or contaminant leaching potential does increase the risk of water quality impacts and is a good indicator of future adverse groundwater quality impacts.

7.3. SUMMARY AND CONCLUSIONS

Overall Findings

Of the 25 case study mines, nine (36%) have developed acid drainage on site to date. Nearly all the mines (8/9) that developed acid drainage either underestimated or ignored the potential for acid drainage in their EISs. Of the 25 case study mines, 19 (76%) had mining-related exceedences in surface water or groundwater. However, nearly half of the mines with exceedences (8/19 or 42%) predicted low contaminant leaching potential in their EISs. The constituents that most often exceeded standards or that had increasing concentrations in groundwater or surface water included toxic heavy metals such as copper, cadmium, lead, mercury, nickel, or zinc (12/19 or 63%), arsenic and sulfate (11/19 or 58% each), and cyanide (10/19 or 53%).

Sixty percent of the case study mines (15/25) had mining-related exceedences in surface water. Of the mines with surface water quality exceedences, four (17%) noted a low potential, seven (47%) a moderate potential, two a high potential, and three had no information in their EISs for surface water quality impacts in the absence of mitigation measures. For the mines with surface water quality exceedences, only one mine, the McLaughlin Mine in California, was correct in predicting a moderate potential for surface water quality impacts with mitigation in place. However, this mine predicted low acid drainage potential, yet acid drainage has developed on site. The other mines with surface water exceedences predicted low potential (not exceeding standards) for impacts in at last one EIS. Therefore, most case study mines predicted no impacts to surface water quality after mitigation were in place, but at the majority of these mines, impacts have already occurred.

The majority (64% or 16/25) of the case study mines had exceedences of drinking water standards in groundwater. However, exceedences at three of the mines, all in Nevada, may be related to baseline conditions; therefore, 52% of the case study mines clearly had mining-related exceedences of standards in surface water. Of the 13 mines with mining-related exceedences in groundwater, only two noted a low potential for groundwater quality impacts in the original EIS, the majority (nine or 69%) stated that there would be a moderate potential, and two stated there was a high potential for groundwater impacts in the absence of mitigation. In terms of predicted (post-mitigation) groundwater quality impacts, 77% (10/13) of the mines with exceedences predicted low groundwater quality impacts in their EISs (including mines predicting low impacts in the original EIS). Therefore, as with surface water, the predictions made about groundwater quality impacts without considering the effects of mitigation were somewhat more accurate than those made taking the effects of mitigation into account. Again, the ameliorating effect of mitigation on groundwater quality was overestimated in the majority of the case study mines.

Findings on Relationship Between Inherent Factors and Water Quality

Overall, for the 13 mines with close proximity to surface water and high acid drainage or contaminant leaching potential, 12 (92%) have had some adverse impact to surface water as a result of mining activity. For all case study mines, only 64% had some surface water quality impact. Eleven of the 13 (85%) have had exceedences of standards or permit limits in surface water as a result of mining activity. Of the 15 mines with close proximity to groundwater and high acid drainage or contaminant leaching potential, all but one (93%) have had mining-related impacts to groundwater, seeps, springs, or adit water. For all case study mines, only 56% had mining-related impacts to groundwater.

For the 15 mines with close proximity to groundwater and elevated acid drainage or contaminant leaching potential, 13 (87%) had mining-related exceedences in groundwater. For all case study mines, only 52% had exceedences in groundwater. These results, although not comprehensive, suggest that the combination of proximity to water resources (including discharges) and moderate to high acid drainage or contaminant leaching potential does increase the risk of water quality impacts and is a good indicator of future adverse water quality impacts. Although this finding makes intuitive sense from a risk perspective, a comprehensive study of cause and effect has never been conducted. Mines with these inherent factors are the most likely to require perpetual treatment to reduce or eliminate the long-term adverse impacts to surface water resources.

8. FAILURE MODES AND ROOT CAUSES OF WATER QUALITY IMPACTS

This section identifies the underlying causes of water quality impacts at the case study mines. It uses information gathered from the case studies presented in Section 6 and conducts a "failure modes" and "root cause" analysis. A failure is an outcome that is different than intended or predicted. A failure mode is the general type of failure that occurred or is predicted to occur (e.g., prediction failure, mitigation failure), while a root cause is the underlying, more specific, reason for the failure. The objective of the analysis presented in this section is to identify the most common types and causes of failures in protecting water quality at existing mines so that the failures can be prevented in future. Results from this analysis can be used to make recommendations for improving both the policy and scientific/engineering underpinnings of EISs.

8.1. METHODOLOGY AND APPROACH

The approach presented in this section uses existing ("historical") information from mines with EISs to identify the causes of water quality impacts that occurred during mining operations. In contrast, most failure modes effects analyses (FMEA) are conducted before operations begin and instead focus on generating predictions from engineering design information (e.g.,, likelihood of failure based on factor of safety calculations). Because our approach is retrospective rather than prospective, we know unequivocally whether a prediction has failed or a water quality failure has occurred. Therefore, the focus of this analysis is to determine what caused the failure to occur. The information used to determine how failure occurred is contained in Section 6, which summarizes and compares water quality predictions in EISs with actual water quality conditions during mining operation.

8.1.1. FAILURE MODES AND ROOT CAUSES

According to Robertson (2003), any approach or mitigation measure that does not achieve the intended result (e.g., to prevent water quality impacts) or that results in undesirable consequences is considered a "failure." This study has identified two primary types, or modes, of failures: characterization and mitigation. Root cause refers to the specific reason or reasons for the failure. Table 8.1 summarizes the failure modes and root causes for all water quality or prediction failures that can be identified in the case studies.

There are two types of characterization failures identified in the case studies: hydrologic and geochemical. Inaccuracies in hydrologic and geochemical characterization can lead to failure to recognize or predict water quality impacts. The primary root causes of hydrologic characterization failures identified in this study are:

- dilution overestimated
- lack of hydrological characterization
- amount of discharge overestimated, and
- size of storms underestimated.

The primary root causes of geochemical characterization failures identified are:

- lack of adequate geochemical characterization, and
- sample size and/or representation.

The other failure mode identified in the case studies is mitigation failures. The primary root causes of mitigation failures identified are:

- mitigation not identified, inadequate or not installed
- waste rock mixing and segregation not effective
- liner leak, embankment failure or tailings spill, and
- land application discharge not effective.

Table 8.1. Water Quality Predictions Failure Modes, Root Causes and Examples from Case Study Mines

Failure Mode	Root Cause	Examples
Hydrologic Characterization	Lack of hydrologic characterization	Royal Mountain King, CA; Black Pine, MT
	Dilution overestimated	Greens Creek, AK; Jerritt Canyon, NV
	Amount of discharge underestimated	Mineral Hill, MT
	Size of storms underestimated	Zortman and Landusky, MT
Geochemical Characterization	Lack of adequate geochemical characterization	Jamestown, CA; Royal Mountain King, CA; Grouse Creek, ID; Black Pine, MT
	Sample size and/or representation	Greens Creek, AK; McLaughlin, CA; Thompson Creek, ID; Golden Sunlight, MT; Mineral Hill, MT; Zortman and Landusky, MT; Jerritt Canyon, NV
Mitigation	Mitigation not identified, inadequate, or not installed	Bagdad, AZ; Royal Mountain King, CA; Grouse Creek, ID
	Waste rock mixing and segregation not effective	Greens Creek, AK; McLaughlin, CA; Thompson Creek, ID; Jerritt Canyon, NV
	Liner leak, embankment failure or tailings spill	Jamestown, CA; Golden Sunlight, MT; Mineral Hill, MT; Stillwater, MT; Florida Canyon, NV; Jerritt Canyon, NV; Lone Tree, NV; Rochester, NV; Twin Creeks, NV
	Land application discharge not effective	Beal Mountain, MT

8.2. EXAMPLES OF CHARACTERIZATION FAILURES FROM CASE STUDY MINES

The following sections provide examples of the various types of characterization failures that were identified from the case study mines in Section 6. The information provided is intended as a short summary identifying the failure modes, root causes and subsequent mitigation. More specific information describing the cause and effects in each case is available in Section 6.

8.2.1. HYDROLOGIC CHARACTERIZATION FAILURES

Incorrect or inadequate hydrological characterization was identified as a contributing factor to water quality impacts at six of the 25 mines evaluated. The failure modes and root causes and effects for each case study with hydrologic characterization failures identified in Table 8.1 are summarized in the following sections.

Greens Creek, Alaska

The original Greens Creek 1983 EIS predicted that dilution would prevent impacts to surface water; however, the 2003 EIS shows that surface water impacts were noticeable in the general mine area and in off-site streams. Stream tributaries were impacted by mine wastes, in part ,due to smaller than predicted flows not providing sufficient dilution of contaminants coming from tailings and waste rock piles. The impacts to surface water were subsequently mitigated by relocating waste rock and capturing and treating tailings leachate.

Royal Mountain King, California
Current data for the Royal Mountain King site shows impacts to groundwater in the vicinity of the waste rock dumps due to near surface groundwater that is resulting in lateral flow and spread of contamination originating from waste rock dump seepage. A more adequate hydrological assessment would have indicated the presence of near surface groundwater and could have allowed for relocation of the waste rock dumps in locations that would not result in groundwater and surface water impacts.

Black Pine, Montana
The waste rock dump has impacted groundwater and springs on the site with acid drainage and is discharging to headwater streams. A lack of hydrologic characterization at the site has led to difficulties in identifying the association between the waste rock dump and springs and seeps at the site and in determining cost effective mitigation methods.

Mineral Hill, Montana
According to the original EIS, the initial low discharge rate (approximately 1gpm) from the underground workings would not result in an appreciable amount of leachate from the workings. At the higher discharge rates (approximately 10 gpm) that existed during operation the amount of discharges were significant and resulting arsenic concentrations exceeded non-degradation water quality standards. The hydrologic characterization conducted for the EIS did not predict significantly more groundwater being encountered by underground mining activities. A more accurate hydrologic evaluation could have allowed for planning of water treatment of mine discharge and may have encouraged a more accurate geochemical characterization.

Zortman and Landusky, Montana
Surface water impacts were associated with storm events exceeding the 100-year design criteria. During the past 25 years, at least four storm events have exceeded the predicted 100-year storm event. In addition to improper design criteria for the mine units and the lack of run-on ditches to prevent upgradient additions to storm events, this suggests that the extent of hydrologic characterization in terms of storm frequency and strength (i.e. amount of rainfall) prediction was inadequate to properly design mine units.

Jerritt Canyon, Nevada
The original 1980 EIS predicted that dilution would prevent impacts to surface water from contaminants. However, subsequent water monitoring data shows that surface water impacts have occurred in the headwaters of streams in the project area, most likely due to contamination from waste rock. Streams were impacted by waste rock in part due to smaller than predicted flows not providing sufficient dilution of contaminants. A more adequate hydrological assessment could have indicated that low flows in headwater streams would not provide adequate dilution.

8.2.2. GEOCHEMICAL CHARACTERIZATION FAILURES

Incorrect or inadequate geochemical characterization was identified as a contributing factor to water quality impacts at 11 of the 25 mines evaluated. The causes and effects for each case study with geochemical characterization failures are summarized below and in Table 8.2.

Greens Creek, Alaska
The Greens Creek 1988 EA predicted no potential for acid drainage in tailings. The 2003 EIS predicted that acid drainage from the tailings would occur but would not become evident for 10 to 33 years (based on static testing) or 500 years (based on modeling results). The 1983 EIS did not address water quality impacts from waste rock, whereas the 1992 EA recognized the potential for acid drainage from waste rock to impact water quality. However, acid drainage is already evident at the site in the general mine area in the form of metal-rich seepage from either the tailings, waste rock, or both sources, suggesting that the geochemical characterization for the predictions in the EISs were not accurate. The root cause of the failure to accurately predict acid drainage could be due to a single factor or a combination of factors such as sample representation, geochemical analysis, modeling and/or interpretation.

Jamestown, California
The geochemical characterization testing (short-term leach tests only) performed for the 1983 and 1991 EIS/EIR did not accurately identify the potential for groundwater impacts that were evident by 1990. Test results indicated that the mine tailings would not contain contaminants that needed to be controlled, and that the overburden material was non-hazardous, non-toxic and non-acid generating. Arsenic and TDS drinking water standards were slightly exceeded in tailings leachate from short-term leach tests, but observed concentrations in groundwater were substantially higher. Therefore, the short-term leach tests were not effective at identifying the contaminants of concern (sulfate and nitrate were not identified as contaminants of concern but exceeded drinking water standards in groundwater) and also underestimated the actual concentrations of constituents in groundwater during operations. In addition, no short-term leach testing was performed on waste rock. The most likely reasons the geochemical characterization failed to identify the potential is due to either sample representation or inadequate geochemical analysis (e.g., failure to perform tests or to perform the appropriate tests, e.g., long-term kinetics tests).

McLaughlin, California
Geochemical characterization conducted in the original McLaughlin Mine EIS appears to have been inadequate, possibly due to inadequate sample representation, lack of kinetic testing, or modeling of results. Acid-base accounting results for waste rock removed from the pit showed that 92% of the waste rock was determined to be either neutral or neutralizing. These results were not accurate for longer-term weathering of waste rock as demonstrated by water quality impacts to groundwater, surface water and pit water at the site. Acid drainage has developed and water resources were impacted by multiple constituents (metals, arsenic, and sulfate).

Royal Mountain King, California
The Royal Mountain King 1987 EIS/EIR did not predict contamination associated with waste rock, however groundwater results show evidence of contamination indicating that geochemical characterization was inadequate. No contaminant leaching potential testing was conducted, but groundwater is contaminated with metals, anions and cyanide. The most likely cause of the failure of geochemical characterization to predict the potential for contamination was static testing results not being accurate for long-term weathering of waste rock. The TTLC levels (standards) used in the static tests also may not have been protective enough to prevent groundwater contamination, or the samples selected for testing may not have been representative.

Grouse Creek, Idaho
The Grouse Creek 1984 EIS did not predict that contaminant leaching from tailings would impact water quality. Initial geochemical characterization tests were apparently conducted on non-representative samples or the "weathering' tests performed were not adequate to infer contaminant potential. Although moderate acid drainage potential was identified in the 1992 EIS, only lead was predicted to exceed drinking water standards in tailings leachate. The 2002 EE/CA showed that prediction to be in error, with actual tailings pore water showing exceedences of standards for aluminum, copper, arsenic, selenium, silver, zinc and cyanide.

Thompson Creek, Idaho
Acid drainage potential tests were not performed on tailings material in the Thompson Creek 1980 EIS. Acid-base accounting tests conducted on waste rock for the 1980 EIS did not predict acid drainage potential, and the tailings were thought to be similar to waste rock in terms of acid drainage potential, although no support for this assumption was provided. The 1999 EIS geochemical characterization tests included kinetic testing and did indicate the potential for acid drainage from waste rock because the NP:AP ratio was 1.5 to 3.1. ABA and kinetic tests performed on tailings material for the 1999 EIS did note that tailings could become acid generating if exposed to air and water. However, the tailings were predicted to not generate acid as long as saturated, oxygen-free conditions were maintained in the impoundment. The characterization predictions failure for the tailings material was in part related to an incorrect assumption that such conditions would exist and be maintained in the impoundment and that they would prevent acid drainage from developing.

Black Pine, Montana
The original Black Pine 1981 EA did not directly test for acid drainage potential but instead used the total sulfide in the ore (<0.2%) as indicative of low potential for acid drainage generation and impacts. The waste rock dump has since impacted groundwater and springs on the site with acid drainage and is discharging to headwater streams.

Golden Sunlight, Montana
The Golden Sunlight 1981 EIS specifically identified the potential for impacts to groundwater, and ABA testing did identify the potential for the ore to be acid producing. However, these results were dismissed because the ore used in the tests was finely ground (400 mesh) rather than being run-of-mine size, and was therefore considered to not be representative of field conditions. The results were also dismissed because previous historic mining activity and waste dump development on the project area did not result in acid drainage, and because there was no discharge from existing underground workings at the site. The ABA test results were qualified based on a statement from the testing laboratory (B.C. Research) that "Experience has shown that generally relatively more gangue than sulphides is exposed at the larger particle size although this may not always be the case." According to the 1990 EA, the analysis was of a single "highwall composite," and the exact location and means of obtaining the sample were unknown. After the 1981 EIS, all subsequent EISs or EAs acknowledged the high potential for acid drainage development.

Mineral Hill, Montana
The potential for elevated arsenic concentrations in groundwater from the mine workings was not specifically recognized in the geochemical characterization of the site conducted in the 1983 EIS or 1988 EA. No geochemical characterization tests were conducted on waste rock, ore or any material representative of the walls of the underground workings. Geochemical characterization on the tailings material did predict the observed increases in three of six constituents found in tailings leachate, and contaminated groundwater and surface water (cyanide, arsenic, and manganese), but not sulfate, nitrate, and TDS, which are not removed by commonly used mine water treatment techniques (e.g., lime precipitation).

Zortman and Landusky, Montana
The Zortman and Landusky 1979 new project EISs were conducted without any geochemical characterization. Acid drainage was not predicted to occur based on the assumption that only oxide ore would be mined. This resulted in heap leach dikes and foundations being constructed in surface water drainages using what later was determined to be a mixed oxide/sulfide waste rock with high acid drainage generating potential, and waste rock with high acid drainage potential to be similarly placed in surface water drainages. The consequences of mine expansion were not addressed until the 1996 EIS. By this time, many unpredicted impacts had occurred, resulting in significant contamination of groundwater and surface water resources.

Jerritt Canyon, Nevada
The initial geochemical characterization in the 1980 EIS did not include acid drainage potential tests and noted only minimal potential for leaching of contaminants from waste rock. The 1994 EIS, based on significant additional testing, did indicate potential for acid drainage and contaminant leaching from at least some materials. The geochemical characterization in the 1980 EIS most likely failed to predict a high enough potential for contamination due to either sample representativeness or the limited geochemical analysis methods employed. Although acid drainage has not developed, the waste rock contamination has since caused off-site impacts to surface water in the mine area for sulfate and TDS.

8.3. MITIGATION FAILURES

Failure of mitigation to perform was identified as a contributing factor to water quality impacts at 16 of the 25 mines evaluated. The cause and effects for each case study are summarized below.

Greens Creek, Alaska
The 1992 EA recognized the potential for acid drainage from waste rock and proposed mixing of acid generating and non-acid generating rock as a mitigation measure. The 2003 EIS water quality information shows that mixing was not

effective to prevent water quality impacts in the general mine area. The 2003 EIS proposed backfilling of all waste rock to prevent acid drainage impacts.

Bagdad, Arizona
The Bagdad 1996 EIS did not predict any potential for impacts. Monitoring showed that impacts to off-site surface water occurred in 1998-2002, likely due to past tailings or pregnant leach solution spills or more recent events. The mitigation intended by the impoundment of tailings and pregnant leach solution failed in the form of a tailings spill or leak resulting in continued off-site impacts to surface water in the mine area.

Jamestown, California
The Jamestown project employed a sub-compacted liner and poorly designed embankment identified in the original EIS as mitigation for the tailings facility. The liner and embankment failed to protect groundwater quality.

McLaughlin, California
The McLaughlin 1983 EIS/EIR predicted that mitigation measures (underdrains, diversion ditches, segregation of PAG rock, lime addition to waste rock runoff) would avoid impacts to groundwater. However, groundwater wells downgradient of waste rock show water quality impacts indicating that the measures, such as mixing and segregation were not effective, resulting in widespread on-site impacts to groundwater and surface water.

Royal Mountain King, California
The Royal Mountain King 1987 EIS/EIR recognized the potential for impacts from tailings but assumed that low permeability material below the tailings would be sufficient as mitigation to protect groundwater. Similarly, the EIS/EIR recognized the potential for impacts from heap leach material, but assumed that a liner (material not specified) would prevent impacts to groundwater. Groundwater contamination downgradient of the tailings impoundment and heap leach area demonstrates that the low permeability material and liner have not prevented groundwater contamination.

Grouse Creek, Idaho
The contingency for groundwater capture and treatment during operations if necessary was mentioned in the Grouse Creek 1992 SEIS, however it was not installed at that time. The existing mitigation employed in the tailings impoundment (French drain designed to allow for capture of tailings leakage) proved to be ineffective at mitigating groundwater and subsequent surface water impacts to off-site water resources that occurred beginning in 1995. Additional mitigation in the form of groundwater capture and treatment has since been employed and has resulted in no detected impacts to surface water since 2001.

Thompson Creek, Idaho
According to the EIS, any acid-producing rock would be mitigated by special handling (segregation) and isolation techniques that are "demonstrated by their use throughout the mining industry." The methods employed at the mine site did not result in mitigation of acid drainage producing rock and instead led to water quality impacts that have required additional mitigation.

Beal Mountain, Montana
The LAD of leach solution, proposed as mitigation in the Beal Mountain 1993 EIS, resulted in damage to vegetation and contamination of groundwater and surface water with cyanide. The LAD system has failed at Beal Mountain because pre-treatment did not adequately reduce contaminants of concern (in particular cyanide compounds, which proved to be toxic to vegetation) and because there was significant groundwater percolation of contaminated solution and relatively rapid (within the same year) transport to surface water.

Golden Sunlight, Montana
The mitigation for the tailings impoundments identified in the Golden Sunlight 1981 EIS and the later 1990 EA failed due to liner design and construction errors and did not prevent migration of leachate from tailings. Contaminated groundwater from the impoundments has sometimes escaped capture systems due to more extensive leakage than

anticipated and operational deficiencies (periodic failure to maintain and operate pumpback system). The design approach for the tailings impoundment with respect to cyanide solution leakage was projected to achieve "from the practical engineering standpoint," a zero discharge facility. The clay liner in the original tailings impoundment and the synthetic liner in the newer tailings impoundment both failed to meet expectations and have resulted in a discharging facility that requires extensive groundwater capture to prevent more extensive groundwater and surface water impacts.

Mineral Hill, Montana
According to the 2001 EIS, the tailings facility design resulted in unanticipated lateral flow that escaped the liner system, resulting in contamination of alluvial groundwater and surface water. The design error occurred due to a lack of consideration of leachate emanating from the tailings impoundment as well as failure to recognize the potential for lateral flow.

Stillwater, Montana
In 2003 it was determined that a tailings underdrain discharge pipe was improperly designed or constructed and was allowing a leak of approximately 10 gpm to groundwater in the vicinity of the dam toe. It was also determined that the LAD solution storage pond liner was not performing as specified ($1x10^{-6}$ cm/sec) and that as much as 150 gpm of solution was seeping into groundwater. In both cases groundwater standards of 2.0 mg/l nitrate were not exceeded in compliance wells, although nitrogen concentrations increased in downgradient wells. The tailings underdrain pipe was repaired and the seepage is no longer detectable. The compacted clay liner in the LAD solution pond was replaced with a synthetic geomembrane liner.

Florida Canyon, Nevada
The exceedences of water quality standards at the Florida Canyon mine from the leach pads is primarily due to failure of mitigation (design, construction and/or operational errors) to adequately prevent leakage of leach solutions.

Jerritt Canyon, Nevada
The mitigation described in the 1980 EIS for the tailings impoundment, a compacted clay liner and embankment constructed to control seepage, failed as shown by the presence of a significant contaminant plume in the groundwater downgradient of the tailings facility. The failure of the liner and embankment seepage control system appears to be due to higher than design permeability most likely indicating either a problem with construction materials or construction practices.

The 1994 EIS proposed mixing and segregation as mitigation for potential acid drainage and contaminant leaching from waste rock. Subsequent monitoring data shows that waste rock continued to contaminate surface water despite implementation of the mitigation.

Lone Tree, Nevada
The tailings impoundment experienced a significant leak that resulted in leachate escaping into the vadose zone. An operational error (tailings were not placed against the embankment) was identified as the cause of the seepage. Newmont commenced remediation activities, which included trenching, and modified operations to promote drying of tails in the area of the embankments.

Rochester, Nevada
The mine has experienced exceedences of groundwater standards in the vicinity of the heap leach pile and ponds due to either spills or leaks in the liner system. Groundwater pump and treat is being used as a mitigation measure and is discussed in the 2003 EA.

Twin Creeks, Nevada
Leachate from the tailings impoundment has degraded groundwater in the vadose zone. An ongoing monitoring program is in place to determine the extent of vadose zone and potential groundwater contamination.

8.4. SUMMARY OF RESULTS

The Failure modes and effects identified in the study are summarized in Table 8.2. The results can be summarized as follows:

Six of 25 mines exhibited inadequacies in hydrologic characterization.
- At two of the mines, dilution was overestimated.
- At two of the mines, a lack of hydrologic characterization was noted.
- At one of the mines, the amount of discharge generated was underestimated.
- At one of the mines, the size of storms was underestimated.

Eleven of 25 mines exhibited inadequacies in geochemical characterization. Geochemical failures resulted from:
- assumptions made about geochemical nature of ore deposits and surrounding areas (e.g., mining will only be done in oxidized area)
- site analogs inappropriately applied to new proposal (e.g., historic underground mine workings do not produce water or did not indicate acid generation)
- inadequate sampling (e.g., geochemical characterization did not indicate potential due to composite samples or samples not being representative of actual mining)
- failure to conduct and have results for long-term contaminant leaching and acid drainage testing procedures before mining begins, and
- failure to conduct the proper tests, or to improperly interpret test results, or to apply the proper models.

Sixteen of 25 mines exhibited failures in mitigation measures.
- At three of the mines, mitigation was not identified, inadequate, or not installed.
- At four of the mines, waste rock mixing and segregation was not effective.
- At nine of the mines, liner leaks, embankment failures or tailings spills resulted in impacts to water resources.
- At one mine, land application disposal resulted in impacts to water resources.

Table 8.2. Summary of Failure Modes for Case Study Mines

Failure Mode	Number of Case Study Mines Showing Failure Mode	Percent of Case Study Mines Showing Failure Mode
Hydrologic Characterization	6	24%
Geochemical Characterization	11	44%
Mitigation	16	64%

8.5. CONCLUSIONS AND RECOMMENDATIONS

This study shows a variety of failure modes and root causes that have led to water quality impacts at hardrock mine sites in the U.S. As a general conclusion and recommendation, it is clear that regulatory review processes, such as EISs, should include an adequate analysis of baseline water quality, hydrological characterization and geochemical characterization and the full identification of appropriate mitigation and potential mitigation failures. The following sections provide conclusions and recommendations specific to the various failure modes identified in this study.

HYDROLOGIC CHARACTERIZATION

The case studies show the indirect cause and effect relationship between inadequacies in hydrologic characterization methods that were employed at mine sites and have resulted in impacts to water resources ranging from on-site contamination and contamination of headwaters streams to more extensive off-site contamination of surface water with the potential need for long-term water treatment in some cases. Hydrological characterization failures are most often caused by over-estimation of dilution effects, failure to recognize hydrological features (e.g., springs and shallow or perched groundwater) and underestimation of water production and stormwater quantities. Requiring adequate hydrological investigations as well as making conservative assumptions about water quality and quantity can address hydrological failures.

GEOCHEMICAL CHARACTERIZATION

The case studies show the indirect cause and effect relationship between inadequacies in geochemical characterization methods that were employed at mine sites and impacts to water resources. The severity of impacts ranged from on-site contamination and contamination of headwater streams to the need for long-term water treatment in some cases. Failure to identify the potential for contaminant leaching and acid drainage development has been a reoccurring theme at mine sites throughout the U.S. The case studies demonstrate the range of impacts to water resources that have occurred as a result of proper or adequate testing. The case studies also demonstrate that inaccurate geochemical predictions often lead to lack of identification of adequate mitigation measures.

Geochemical characterization failures can be addressed by emphasizing fundamental scientific requirements in the regulatory process. Such requirements should include adequate sample representation and testing, and interpretations that recognize the fundamental uncertainties and limitations of characterization testing. Improved geochemical characterization will lead to improved identification and of mitigation measures. As the most common characterization failure mode, the elimination of geochemical characterization failures can provide a large contribution to ensuring accurate water quality predictions and outcomes at hardrock mine sites.

MITIGATION

Waste rock mixing and segregation

At many mines, waste rock containing acid generating materials is managed by mixing and segregation practices. In most cases no data is available to ascertain the effectiveness of those practices, particularly where there is a significant distance from the source to water resources. The cases cited all have nearby water resources that were impacted. The data suggests that distance to water resources is potentially the most significant factor as to the effectiveness of waste rock mixing and segregation. Mitigation may depend more on climate and factors such as distance and geology affecting travel time and attenuation of contaminants. Where acid drainage generating materials are present, particularly in areas of headwater streams, waste rock mixing and segregation may not prevent impacts to water resources. These types of failures can be addressed by requiring adequate geochemical and hydrologic characterization and ensuring that segregated wastes are placed away from potential water pathways.

Liner leak, embankment failure or tailings spill

The case studies show that mitigation intended to capture contaminants such as liners and tailing impoundments may fail and lead to groundwater and surface water quality impacts. While in most cases, impacts are limited to on-site groundwater and nearby surface water, in some cases the impacts can result in more extensive surface water impacts and potentially to long-term water treatment. In all cases, additional mitigation, most often in the form of groundwater capture and treatment (including perpetual treatment in those severe cases), has resulted in effective capture and treatment of contaminants.

Failure of liners and tailing impoundments to perform is typically caused by design, construction and operational mistakes. These features frequently fail to perform, so it is important to consider the likelihood and consequences of those failures and to identify and implement additional mitigation that can be employed in the event of such failures. In many cases where initial mitigation has failed, such as mines where liner leaks have occurred, additional mitigation in the form of groundwater capture and treatment are often necessary. Additional consideration needs to be given to including groundwater capture and treatment systems as original designed mitigation for high risk features such as tailings impoundments containing cyanide in high risk (near surface water or groundwater) areas.

Land application discharge

The case study shows that land application, instead of acting as a disposal mechanism to facilitate zero discharge, can result in impacts to groundwater and surface water. The impacts demonstrated in this case study were recognized at other land application sites. With the exception of land application for the disposal of low-levels of nutrients that can be applied at agronomic rates, land application disposal has demonstrated a high rate of failure and significant impact at hardrock mine sites in the United States.

9. REFERENCES

Bolen, A.2002. Regulating the unknown: Pit lake policies state by state. Southwest Hydrology, Vol 1 #3, 22-23.

Coleman, J. 2004. Memorandum from John Coleman, Great Lakes Indian Fish and Wildlife Commission, to Neil Kmiecik, Biological Services Director. Re: Report on the status of the Flambeau Mine, February 22, 2004.

Council on Environmental Quality (CEQ), 1997, *The National Environmental Policy Act: A Study of Its Effectiveness After Twenty-Five Years.*

Dubois V. U.S. Department of Agriculture (1st Cir. 1996)

Enforcement History and Online Database (ECHO), http://www.epa.gov/echo/

Infomine (2004), http://www.infomine.com/

Kempton, H., and Atkins, D., 2000. Delayed environmental impacts from mining in semi-arid climates. Proceedings from the Fifth International Conference on Acid Rock Drainage, ICARD 2000, Volume 1. Published by the Society for Mining, Metallurgy, and Exploration, Inc., May 21-24, 2000, Denver, Colorado, pg. 1299-1308.

Kimmel, T., 2004, *GRG301K Weather and Climate Koppen Climate Classification Flow Chart*, www.utexas.edu/depts/grg/kimmel/GRG301/grg301kkoppen.html.

Koppen Climate Classification, 2004, www.geofictie.nl/ctkoppe2.htm.

Kuipers, James R., 2000, *Hardrock Reclamation Bonding Practices in the Western United States.* National Wildlife Federation, Boulder, CO, February 2000.

Lehrke, S. 2004. Memorandum from Stephen Lehrke, Foth & Van Dyke, to Jana Murphy, Flambeau Mining Company. Re: Flambeau Mining Company – 2003 Annual Report Groundwater and Surface Water Trends. January 1, 2004.

Maest, A., J. Kuipers, C. Travers, and D. Atkins. 2005. Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art.

Mayer, K.U., Frind, E.O., and Blowes, D.W., 2002. A numerical model for the investigation of reactive transport in variably saturated media using a generalized formulation for kinetically controlled reactions. Water Resources Research #38.

Plumlee, G.S., 1999. The environmental geology of mineral deposits. Chapter 3 In: The Environmental Geochemistry of Mineral Deposits, G.S. Plumlee and M.J. Logsdon, eds., Rev. Econ. Geol. V 6A, Soc. Geol. Inc., Littleton, CO, 71-116.

Randol Mining Directory, U.S. Mines & Mining Companies (1990/1991, 1994/1995, 1999), Randol International Ltd, Golden, CO.

Robertson, A and Shaw, S, 2003. Risk Management for Major Geotechnical Structures on Mines, Vancouver, Canada.

Seal, R. R. II and Hammarstrom, J.M., 2003. Geoenvironmental models of mineral deposits: Examples from massive sulfide and gold deposits. Chapter 2 in: Jambor, J.L., Blowes, D.W., Ritchie, A. (Eds), *Environmental Aspects of Mine Wastes.* Mineralogical Association of Canada, Short Course Series, Vol. 31, pg. 11 – 50.

Appendix A
Major Mine Statistical Information

(available at www/kuipersassoc.com or http://www.mineralpolicy.org/publications_welcome.cfm)

Appendix B
Case Study Detailed Information

(available at www/kuipersassoc.com or http://www.mineralpolicy.org/publications_welcome.cfm)

GREATERYELLOWSTONE.ORG
LOCATIONS IN MONTANA, IDAHO & WYOMING

HEADQUARTERS
215 South Wallace Avenue
Bozeman, Montana 59715
406.586.1593

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

August 2, 2017

Dear Chairman Murkowski and Ranking Member Cantwell:

RE: Yellowstone Gateway Protection Act, S.941

Please accept the following 64-page report into official record for the July 26, 2017 hearing of the Forest, Mining and Public Lands subcommittee of Senate Energy and Natural Resources. The Subcommittee Chairman, the Honorable Senator Lee, stated the record would remain open for two weeks following the hearing.

Reference:

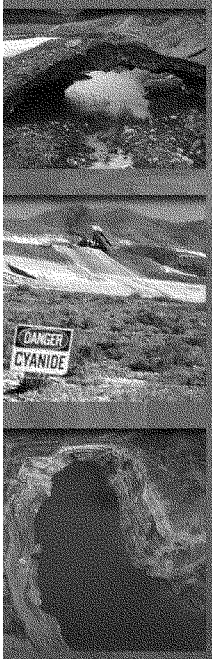
- Gestring, B and Hadder, J. *U.S. Gold Mines: Spills & Failures Report. Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water.* Earthworks. Washington DC. July 2017
  Available at: https://www.earthworksaction.org/USgoldminefailures

Acid mine drainage can develop at gold mines where sulfide minerals are present. When sulfide minerals are exposed to air and water, the react to form sulfuric acid, which can leach minerals from the surrounding rock to form acid mine drainage. If the acid mine drainage is not contained, it becomes a long-term source of contaminants.

It is important to note that the 27 U.S. gold mines in this report are currently operating subject to existing state and federal regulations, often referred to a "modern mining methods." They represent 93% of U.S. gold production in 2013 – the most current data available from the US Geological Survey. They were all predicted to meet or exceed water quality and safety standards or else they would not have been permitted. Yet 100% of these mines experienced at least one pipeline spills or other accidental releases and 74% have failed to control contaminated mine seepage with the development of acid mine drainage associated with some of the most lasting impacts.

Respectfully Submitted,

Joe Josephson
Montana Conservation Associate
Greater Yellowstone Coalition



The Track Record of Environmental Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water

U.S. Gold Mines
Spills & Failures Report

EARTHWORKS

Great Basin Resource Watch

U.S. Gold Mines Spills & Failures Report

The Track Record of Environmental Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water

JULY 2017

BY BONNIE GESTRING AND JOHN HADDER

Report available at earthworksaction.org/USgoldminefailures

COVER PHOTOS, TOP - DOWN:
Pit lake at Lone Tree Mine, Nevada. Photo by Bruce Gordon.
Acid mine drainage at Kensington Mine, Alaska. Photo by U.S. Forest Service.
Cyanide warning sign at Hycroft Mine, Nevada (formerly Crofoot Lewis).

EARTHWORKS
Main Office 1612 K Street, NW, Suite 904
Washington, DC 20006 • p: 202.887.1872 f: 202.887.1875
email: info@earthworksaction.org . www.earthworksaction.org

Earthworks is dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.

GREAT BASIN RESOURCE WATCH
P.O. Box 207 • Reno, NV 89504
p: 775.348.1986 • www.gbrw.org

Great Basin Resource Watch is a regional environmental justice organization dedicated to protecting the health and well being of the land, air, water, wildlife, and human communities of the Great Basin from the adverse effects of resource extraction and use.

EARTHWORKS

Great Basin Resource Watch

Table of Contents

Introduction 5

Methods 7

Results 8

TABLE 1 - 2013 gold production amounts for mines reviewed in this report 9

TABLE 2 - Synopsis of pipeline spills and other accidental releases, and mine water capture and treatment failures (e.g. seepage) for U.S. gold mines 10

Mine Operations Data 12

Carlin Operations, NV 12

Phoenix Mine, NV 13

Twin Creeks Mine, NV 15

Cortez Hills and Pipeline Mines, NV 18

Barrick Goldstrike – North Block, NV 19

Fort Knox Mine, AK 20

Pogo Mine, AK 21

Smoky Valley/Round Mountain Mine, NV 22

Turquoise Ridge, NV 25

Bingham Canyon Mine, UT 27

Hycroft Mine, NV (Crowfoot-Lewis) 29

Marigold Mine, NV 31

Buckhorn Mine, WA 33

Jerritt Canyon Mine, NV 34

Kensington Mine, AK 38

Mesquite Mine, CA 39

Bald Mountain Mine, NV 40

Golden Sunlight Mine, MT 41

Ruby Hill Mine, NV 43

Greens Creek Mine, AK 44

Wharf Mine, SD 46

Robinson Mine, NV 48

Florida Canyon Mine, NV 50

Mineral Ridge, NV 52

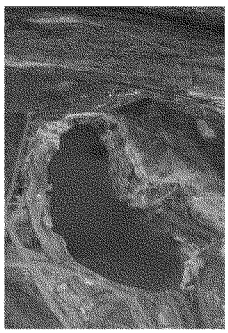
Briggs Mine, CA 53
Rochester Mine, NV 54
Denton Rawhide Mine, NV 56
References 57

Introduction

Gold mining is a significant source of toxic releases in the U.S. – including releases of cyanide, arsenic, mercury, cadmium and other hazardous substances to the air, water and land.[1]

The most common method for processing gold from mining is cyanide leaching, which uses cyanide to extract gold and other metals from ore. Cyanide leaching facilitates the mining of low-grade ores, generating large volumes of mine waste that become a permanent feature on the landscape.

This mine waste, as well as the processing chemicals used to extract the gold, can be a source of pollution to surface and groundwater. Because virtually everything that is mined becomes waste, and this waste is disposed of on the mine site, the toxic materials contained in the waste are permanent as well.



Lone Tree Mine pit lake. Photo by Bruce Gordon.

This report compiles the record of spills and seepage control failures at operating gold mines in the United States and documents associated water quality impacts.

The mine facilities where releases of hazardous materials can occur include heap leach pads, tailings impoundments, pipelines, process water ponds, waste rock piles and pit lakes.

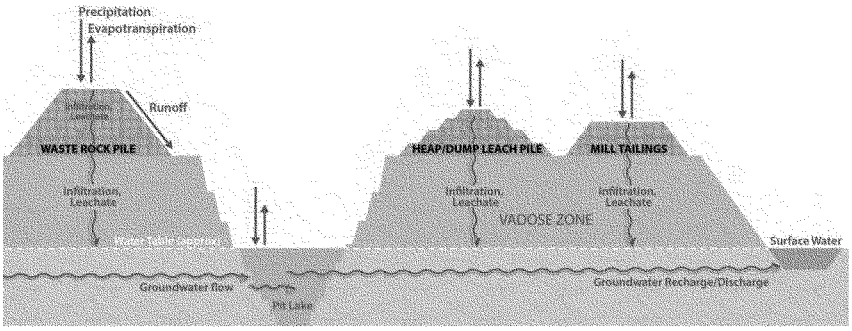
- **Heap leach pads:** Heap leach pads are used to process lower grade ore using surface irrigation with a sodium cyanide solution, which picks up gold and other metals as it infiltrates through the ore. Leach pads often have one containment liner that serves as the primary capture for the gold and cyanide-laden (pregnant) solution. Some mines incorporate two liners. The second liner is used to monitor for leakage of the primary liner. Despite the existence of these liners, leakage still occurs when the liner is compromised or degrades over time.
- **Tailings:** Higher grade ore is crushed and combined with processing chemicals in large vats. The waste product, called tailings, are usually stored as a fine textured slurry behind an earthen dam. In most cases these tailings impoundments are not lined.
- **Process ponds** are lined, of much smaller size and are typically completely removed as part of the reclamation process.
- **Heap leach pads, tailings impoundments and process solution ponds** generally contain high levels of metals and cyanide, so containment is vital to avoid contamination. These facilities can be a long-term source of pollution if reclamation and long-term maintenance are inadequate.

Acid mine drainage, Kensington Mine, Alaska. Photo by U.S. Forest Service.

Acid mine drainage can develop at gold mines where sulfide minerals are present. When sulfide minerals are exposed to air and water, they react to form sulfuric acid, which can leach minerals

from the surrounding rock to form acid mine drainage. If the acid mine drainage is not contained, it becomes a long-term source of contaminants.

When mining occurs below the water table, dewatering is required to keep the mine dry. Once mining operations cease, ground water seeps back into the underground mine workings, or back into the pit to create a pit lake. For open pit mines, since most gold mines occur in areas of high evaporation, the flow of water is typically into the open pit. However, if outflow occurs, groundwater can be degraded since pit lake water and water from underground mine workings is typically of poorer quality than the surrounding groundwater.



This diagram illustrates the various mine components that can become a source of contaminants to surface and/or groundwater.

Methods

This report is based on information gathered from an extensive review of state and federal documents, news reports, and a federal database. It provides data for 27 operating U.S. gold mine operations, representing 93% of U.S. gold production in 2013 – the most current data on U.S. gold production available from the U.S. Geological Survey.[2] The report focuses on documenting two failure modes:

1) pipeline spills and/or other accidental releases of hazardous materials[3] and
2) seepage collection and treatment failures.[4]

Although the report focuses on water quality impacts, soil impacts may also occur from a hazardous release. This report does not catalog soil impacts.

Most of the mines in this report are primarily gold producers. However, gold can be produced as a by-product at other metal mines (e.g., copper, zinc/lead operations). This report includes data from the Bingham Canyon, Robinson and Greens Creek mines because gold is a significant by-product as identified in the 2013 U.S.G.S. gold report. The report did not evaluate the Cresson (Cripple Creek and Victor Mine), an operating gold mine in Colorado, due to the difficulty in obtaining comprehensive information on the site.

Results

Our research determined that 100% of the mine operations reviewed in this report experienced at least one failure, with most mines experiencing multiple failures.

- **27 of the 27 mining operations (100%) have experienced at least one pipeline spill or other accidental release**, such as spills of cyanide solution, mine tailings, diesel fuel, and ore concentrate.
- **20 of the 27 mining operations (74%), have failed to capture or control contaminated mine seepage**. The seepage of cyanide solution was one of the more common impacts. The development of acid mine drainage was associated with some of the most lasting impacts.
- **Water quality impacts to surface and/or groundwater were identified at 20 of the 27 mining operations (74%)**, including impacts to drinking water supplies for residential homes and businesses, loss of fish and wildlife habitat, and fish kills.
- **Water quality impacts were not identified at 7 out of 27 mining operations**. At 6 of those 7 mines (86%), no perennial streams were present in the project area and groundwater was generally deep.

Research shows that mines with high acid generating potential and in close proximity to surface and groundwater are at highest risk for water quality impacts.[5] Availability of water is key to the development of acid drainage and the extent of containment. Many of the currently operating gold mines are located in the arid southwest, where precipitation is low (often less than 10 inches per year). Thus, the potential for surface precipitation to carry contaminants to the groundwater is significantly limited. Acid mine drainage will require water treatment and capture in perpetuity at the Bingham Canyon Mine, Golden Sunlight Mine, and Phoenix Mines, among others.

At 6 of the 7 gold mines where water quality impacts were not identified (e.g., Bald Mountain, Ruby Hill, Mineral Ridge, Mesquite, Denton/Rawhide, Turquoise Ridge) no perennial streams are present in the project area and groundwater is generally deep (>250 feet). For example, at the Denton Rawhide mine in Nevada, groundwater is so deep that it has not been located and there is no surface water within five miles of the mine. Impacts to ephemeral streams, where water flows only briefly after rainfall events, are more difficult to assess. Monitoring opportunities are limited, and in some cases ephemeral streams are not protected by the provisions of the Clean Water Act.[6] For example, at the Mineral Ridge Mine, the ephemeral streams in the mine area were determined to be non-navigable, and therefore, not subject to the water quality protections and monitoring requirements provided by the Clean Water Act.[7]

The ability to fully realize the extent of impacts is hampered by the limitations of monitoring. Often seepage from tailings or other mine facilities are recognized by a visual inspection of the containment dam. However, seepage can and has occurred from portions of a facility that are not monitored or difficult to monitor. In many cases, documentation of the failure does not occur until contamination reaches the nearest down gradient water monitoring point. As stated above, the depth to groundwater can be great and there is the potential that a containment failure could occur and not be noticed until after the mine is closed. Despite the incorporation of leak detention systems, which are applied at most new mines, (regulations vary from state to state) many failures of containment occur beyond detection.

TABLE 1 - 2013 gold production amounts for mines reviewed in this report			
Mine	**Location**	**Company**	**2013 Gold Production (Kilograms)**
Newmont Operations	NV	Newmont	53,200
• Carlin Operations			
• Phoenix			
• Twin Creeks			
Cortez and Pipeline Mines	NV	Barrick	41,600
Goldstrike	NV	Barrick	27,700
Fort Knox/True North	AK	Kinross	13,100
Pogo	AK	Sumitomo (50%); Barrick (50%)	10,400
Smoky Valley	NV	Kinross (50%); Barrick (50%)	9,700
Turquoise Ridge	NV	Barrick	6,970
Bingham Canyon	UT	Kennecott	6,430
Hycroft	NV	Allied Nevada	5,940
Marigold	NV	Goldcorp	5,080
Kettle River - Buckhorn	WA	Kinross	4,670
Jerritt Canyon	NV	Veris Gold	4,340
Kensington	AK	Coeur Mining	3,570
Mesquite	CA	New Gold	3,330
Bald Mountain	NV	Barrick	2,920
Golden Sunlight	MT	Barrick	2,860
Ruby Hill	NV	Barrick	2,830
Greens Creek	AK	Hecla	1,790
Wharf	SD	Goldcorp	1,750
Robinson	NV	KGHM International	1,480
Florida Canyon	NV	Jipangu	1,440
Mineral Ridge	NV	Scorpio	1,220
Briggs	CA	Atna Resources	990
Rochester	NV	Coeur Mining	960
Denton Rawhide	NV	Rawhide	743
Total production of listed mines			215,013
Total U.S. production[8]			230,000
Percent of total U.S. production			93%

TABLE 2 - Synopsis of pipeline spills and other accidental releases, and mine water capture and treatment failures (e.g. seepage) for U.S. gold mines

Mine Operations	Pipeline spills and/or other accidental releases*	# of pipeline spills and/or other releases	Mine water collection and treatment failures	Water quality impacts to surface water and/or groundwater
Carlin Operations	YES	11	YES	Cyanide has exceeded water quality standards in Maggie Creek and James Creek. Groundwater has also been degraded by cyanide.
Phoenix	YES	4	YES	Springs and seeps have exceeded drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. Surface water has been adversely affected by acid mine drainage. Groundwater has exceeded water quality standards for many pollutants.
Twin Creeks	YES	38	YES	Groundwater has been degraded with cyanide, arsenic, total dissolved solids, and there have been water quality violations for arsenic in Rabbit Creek. Cyanide solution has also reached Kelley Creek.
Cortez and Pipeline Mines	YES	31	YES	Groundwater has been degraded with arsenic, sulfates, total dissolved solids and cyanide.
Goldstrike North Operations	YES	12	YES	Springs in Antelope Creek drainage have been adversely affected by acidic seepage (low pH).
Fort Knox/ True North	YES	2	None identified	None identified.
Pogo	YES	1	YES	Groundwater has been degraded and there have been violations of surface water quality standards for manganese, pH, cyanide and iron for discharges to the Goodpaster River.
Smoky Valley (Round Mountain)	YES	49	YES	Groundwater has been degraded with cyanide.
Turquoise Ridge	YES	36	None identified	None identified. There are no perennial streams in the project area.
Bingham Canyon	YES	28	YES	Waste water from the mine has escaped the site's collection system, contaminating groundwater with metals, pH and sulfates. The groundwater plume covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[9] Water treatment in perpetuity will be required at this mine to treat acid mine drainage. The release of hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.
Hycroft	YES	16	YES	Water quality standards for cyanide, mercury selenium and nitrates have exceeded water quality standards in groundwater.
Marigold	YES	14	YES	Groundwater has been degraded with chloride, total dissolved solids and cyanide.
Kettle River (Buckhorn)	YES	1	YES	The mine has degraded water quality in Gold Bowl Creek, Nicholson Creek, Upper South Fork Bolster Creek and Marias Creek, as well as groundwater, seeps, and springs. Water quality violations occurred for exceedances of total dissolved solids (TDS), total suspended solids (TSS), ammonia, arsenic, chloride, copper, lead, mercury and zinc.[10]

Mine Operations	Pipeline spills and/or other accidental releases*	# of pipeline spills and/or other releases	Mine water collection and treatment failures	Water quality impacts to surface water and/or groundwater
Jerritt Canyon	YES	40	YES	Water quality standards in groundwater have been exceeded for chloride, arsenic, sulfates, total dissolved solids and trichloroethane, and groundwater has been degraded by cyanide, and in some cases antimony, cadmium, magnesium, mercury, nitrates and selenium. Surface water has been impaired in Sheep Creek, North Fork Humboldt River and South Fork Owyhee.
Kensington	YES	2	YES	Acid mine drainage has degraded water quality in Lower Slate Lake and mine discharges have caused water quality violations for manganese, zinc, aluminum and cadmium in East Fork Slate Creek. Water treatment in perpetuity will be required due to acid mine drainage.
Mesquite	YES	15	None identified	None identified. No perennial streams. The closest perennial surface water is approximately 15 miles southwest of the site.
Bald Mountain	YES	12	None identified	None identified. There are no perennial streams in the project area.
Golden Sunlight	YES	10	YES	The mine has violated water quality standards for cyanide in groundwater, and adversely affected groundwater in four domestic wells and a veterinary clinic. Water treatment in perpetuity will be necessary to capture and treat acid mine drainage.
Ruby Hill	YES	3	None identified	None identified. No perennial streams exist in the permit area and ephemeral drainages were to be eliminated with the construction of the East Archimedes pit.
Greens Creek	YES	8	YES	Surface water in Further Creek, Further Seep and Duck Blind Drain has been degraded with sulfates, lower pH and zinc. Surface water quality standards for zinc and lead have been violated as a result of discharges into Greens Creek, and violations have occurred as a result of discharges of diesel oil and drilling mud to Zinc Creek. Contaminated sediments in Hawk Inlet have occurred as a result of a spill of ore concentrate. Groundwater has been degraded with sulfates.
Wharf	YES	11	YES	Exceedances of water quality standards for nitrates, arsenic and cyanide in groundwater. Annie Creek has been polluted with selenium, ammonia, cyanide, arsenic above water quality standards. Adverse impacts to surface water in Annie Creek resulted in a fish kill, and adverse impacts to the fish population.
Robinson	YES	15	YES	The mine has caused groundwater degradation, and a consent decree was executed in response to a major release of mine tailings process water that harmed 2.3 miles of stream bed.
Florida Canyon	YES	25	YES	Water quality standards for cyanide, mercury and nitrates have been exceeded in groundwater.
Mineral Ridge	YES	3	None identified	None identified. No springs or seeps are located within the Project Area and only ephemeral drainages are present.
Briggs	YES	2	YES	Water quality standards for cyanide have been exceeded in groundwater.
Rochester	YES	12	YES	Groundwater has been degraded with arsenic, mercury, manganese, nitrate/nitrite, total dissolved solids and cyanide. American Canyon (an intermittent drainage) has been adversely affected by process solution. Exceedances of water quality standards for nitrate and arsenic have occurred in American Canyon springs.
Denton Rawhide	YES	10	None identified	None identified. Groundwater was not located, and there is no surface water within 5 miles of the mine.

*Limitations in the data for pipeline spills and other accidental releases make it difficult to determine, in some cases, whether water quality impacts resulted from the spill.

Mine Operations Data

Carlin Operations, NV[11] The Carlin Operations are located in Eureka County, Nevada, between 6 and 21 miles north of the town of Carlin and 35 to 40 miles west of Elko. The Carlin Operations include the North and South Area Operations. The South Area Operations site is located in Eureka County, Nevada and consists of the Gold Quarry open pit mine. The North Area Operations site is located in Eureka and Elko Counties, Nevada. The operation consists of: 1) The Carlin, Genesis/Blue Star, Post, Bootstrap/Capstone, Tara, Beast, Sold, North Star, Payraise, Bob Star, Bobcat, Pete, Castle Reef, and Crow open pits; 2) Carlin, Deep Star, Deep Post, and Leeville underground mines.	
Reports of pipeline spills and other accidental releases[12]	According to the 2014 NPDES Fact Sheet, mill tailings, and sewage from the Carlin North and South area facilities are pumped to the Mill 5/6 Tailings Storage Facility Booster Pump House. Over the years, failures of pipelines, pumps, and valves have resulted in excursions of tailings slurry and associated process solution outside the original limited containment of the Mill 5/6 Tailings Storage Facility Booster Pump House and onto unlined areas.[13] **July 9, 2014:** At Gold Quarry, 6,400 gallons of process solution (.33 mg/L WAD cyanide) was spilled due to a damaged pipeline from construction activity. April 29, 2008: A report of a release from the slurry tank of 110,632 gallons of cyanide solution.[14] The release affected soil and a roadway. **December 21, 2000:** A report of 69,000 gallons of pregnant solution released from pregnant pond leak detectors in North Area leach facility due to unknown causes.[15] **June 16, 1997:** A news report of 245, 000 gallons of cyanide solution released as the result of a heap leach pad failure and discharged into James Creek. About 18,000 gallons then flowed into Maggie Creek.[16] Cyanide levels were well above drinking water standards when the spill reached Maggie Creek. The spill was caused when material on the leach pad slid, breaking a cyanide solution line. The company reported fish fatalities. **August 17, 1993:** A report of a release of 1.58 pounds of mercury from sump pump leak due to a broken shaft.[17] **April 16, 1990:** A report of 13 pounds of cyanide spilled due to failure of drainage valve in storage tank.[18]
Seepage collection and treatment failures	In 2012, acid mine drainage was observed seeping from the south wall of the Pete Pit and forming a small pit lake in the spring of 2011 after a small pit wall failure.[19] A makeshift HDPE-lined sump was constructed to collect the drainage and transport it via water truck to the Leeville De-Sedimentation Project. In the summer/fall of 2012 an additional splay of the Pete Pit stormwater diversion ditch was constructed to collect and divert stormwater from an area below the existing diversion ditch but above the rim of the Pete Pit. It is hoped that this additional diversion will dry up the acid mine drainage seep in the Pete Pit. In 1990, it was determined, based on the presence of cyanide and elevated Total Dissolved Solids (TDS) in downgradient monitoring wells, that the James Creek Tailings Storage Facility at Gold Quarry was leaking process solution into groundwater.[20] Pumpback wells were installed to achieve compliance by 1996.
Impacts to water resources	Cyanide has exceeded water quality standards in Maggie Creek and James Creek. Groundwater has also been degraded by cyanide.

Phoenix Mine, NV The Phoenix Mine is located in north-central Nevada in Lander County, 12 miles southwest of Battle Mountain. The mine is located on public BLM lands and private lands. The mine was originally permitted in 2003.	
Reports of pipeline spills and other accidental releases	**June 3, 2014:** Cyanide solution release occurred as a result of leaks in the leach pad. The holding pond for the leach pad leaked fluid, which were released into the soil. Soil contamination near the leach pad is possible. Dead ducks were found in the holding pond. Some contaminated items – acid, copper and lead – taken to the local landfill within 3 weeks.[21] **Feb 10, 2014:** 1,404 gallons of tailings seepage leaked as a result of overflow from the seepage tank. The seepage was collected from the North Fortitude Waste Rock Facility.[22]Dec 12, 2013: 200 gallons of 93% sulfuric acid were released to pavement and ground during offloading from delivery tanker to storage tank due to a hose coupling failure during the transfer. Affected soils were to be removed and placed on the copper heap leach pad. The contaminated soil was replaced with clean fill.[23] **February 26, 2008:** A failure of the tailings pipeline resulted in the release of approximately 49,000 gallons of tailings slurry. The pipeline was quickly repaired however further investigation revealed the presence of HDPE liner fragments within the Tite- Liner® pipe, indicating that the internal liner surface has started to shear (peel) off.[24]
Seepage collection and treatment failures	**2006:** Seepage of a small quantity of low pH and poor quality water was discovered at the toe of the historic Box Canyon Waste Rock Facility (BCWRF) in early 2006, following an intense precipitation event. Flow was estimated at approximately 2 gallons per minute. An EDC was approved 11 September 2006, to construct a solution collection, conveyance, and storage system at the toe of the Box Canyon Waste Rock Facility, similar in design to that constructed for the North Fortitude Waste Rock Facility seeps.[25] **2005:** Seepage of low pH and poor quality solution emanating from a portion of the southern toe of the North Fortitude Waste Rock Facility (NFWRF) was noted in June 2005 and formally inspected during a 30 August 2005 compliance inspection. Flow emanates from two locations along a 300-foot width of the toe and ultimately migrates to a natural drainage and into the Fortitude Pit along the north pit wall. The seepage rate averages approximately 2 gpm except during storm events when the solution volume is significantly increased by meteoric contributions reporting to the waste rock facility and the natural drainage watershed area. Solution at the seep exhibits an average pH of 3 and the Fortitude Pit Lake exhibits an average pH of 4 or less. Solution at both locations also reports exceedances for numerous Profile I constituents.[26] **2002:** Ground water from the Gold Tailings Facility (monitoring wells CVM-1, CM-22, CM-24, PW-1, PW-4), contains elevated concentrations of chloride, sodium, and sulfate, which is the result of a solute plume originating from the Gold Tailings Facility. This plume is the result of an unlined disposal area that was used for copper and gold tailings intermittently from 1965 to 1993. The chloride plume is currently being managed under the State of Nevada Water Pollution Control Permit.[27] **2002:** According the 2002 Final Environmental Impact Statement, iron concentrations were highest in the ground water samples from the Copper Leach Area and the Midas Pit, reaching 1,500 and 100 milligrams per liter, respectively. However, ground water samples throughout the study area had iron concentrations that exceeded the secondary drinking water standard of 0.6 milligrams per liter, including the Copper Leach Area, Fortitude Pit, Galena Canyon, Iron Canyon, Midas Pit, Philadelphia Canyon, proposed Phoenix Pit, proposed Reona Pit, and the West Copper pit.

	PHOENIX MINE, NV - CONTINUED Manganese concentrations show a pattern similar to iron, reaching their highest level of 190 milligrams per liter at the Copper Leach Area and showing widespread exceedances of the secondary drinking water standard of 0.1 milligram per liter over the entire study area, including Buffalo Valley, Copper leach Area, Fortitude Pit, Fortitude Waste Rock Facility, Galena Canyon, Iron Canyon, Midas Pit, Philadelphia Canyon, proposed Phoenix Pit, proposed Reona Pit, and East Copper Pit. Aluminum concentrations exceeded the secondary drinking water standard of 0.2 milligrams per liter in ground water samples from the Midas Pit and the proposed Phoenix Pit, although aluminum was not determined for all samples.[28] "The most acidic surface waters occurred adjacent to historic mining facilities and mineralized areas (e.g., Iron Canyon and Butte Canyon). The total dissolved solids concentrations in samples from these surface waters often exceeded the drinking water standard of 500 milligrams per liter and had pH values less than the drinking water standard of 6.5 (Figure 3.2-6). These surface waters also had the highest metal concentrations. In general, the metal concentrations in these springs and seeps exceed drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. "The combination of low pH and high dissolved metal and sulfate concentrations reported for surface waters, found near historic mining facilities and mineralized areas, indicates that acid rock drainage exists. Acid rock drainage is caused by water and air interacting with sulfide minerals commonly present in ore deposits. This result has been observed in surface water from Iron and Butte Canyons."[29] Groundwater at the site has been affected by the numerous leaks and seepages from mine facilities. "The oxidation of sulfide minerals is the primary cause of acid rock drainage observed in the surface and ground water monitoring locations adjacent to existing mines and excavated areas."[30] The Fortitude Pit Lake water is of poor quality. Based on the 2005 analysis of the treated water, Nevada Profile I maximum contaminate level (MCL) exceedances were reported for sulfate, lead, nickel, manganese, cadmium, and total dissolved solids.[31] The pit lake is being dewatered currently for water use at the mill. **1998:** Low quality stormwater drainage was noted in the Iron and Butte Canyons. Battle Mountain Gold began collecting and treating acidic surface water from Iron Canyon and Butte Canyon in April 1998 (Brown and Caldwell 1998c).[32] Acid mine drainage continues from these areas. As of the end of 2015, acidic water (pH 2.81 – 3.21) was collected from the Iron Canyon drainage.[33] Dead ducks were found in the leach fluid leak holding pond.
Impacts to water resources	Springs and seeps exceeded drinking water standards for antimony, arsenic, beryllium, cadmium, copper, chromium, fluoride, iron, magnesium, manganese, mercury, nickel, nitrate, pH, sulfate, total dissolved solids, and zinc. Surface water has been adversely affected by acid mine drainage. Waterfowl fatalities have occurred. Water quality exceedances have also occurred in groundwater.

Twin Creeks Mine, NV The Twin Creeks Mine (Rabbit Creek and Chimney Creek Mines) is located on private and public land approximately 26 miles northeast of Golconda, NV. The open pit mine was permitted in 1997.	
Reports of pipeline failures and other accidental releases[34]	**July 26, 2016:** 4,000 gallons of process solution (no cyanide content) was spilled due to a drain valve failure. **July 15, 2015:** 24,000 gallons of process water containing 0.006 lbs. of cyanide was spilled when a process line split. **June 30, 2013:** Approximately 191,000 gallons of tails slurry was released due to a disconnect elbow joint in the line. **September, 5 2012:** 2,984 gallons of process solution of unknown concentration was spilled when a mill line failed. **February 20, 2013:** 9,200 gallons of tails slurry containing 0.52 lbs. of cyanide was released due to a separated flange on the CIL-Tails discharge line. **September 17, 2012:** 1,253 pounds of carbon containing 1.74 lbs. of mercury was released in a landfill from a baghouse sock malfunction. **February 1, 2008:** 800 gallons of barren cyanide solution with a concentration of 18 mg/L was spilled due to a pump failure resulting in an overflow. **September 11, 2007:** Approximately 45,000 gallons of barren solution containing about 68.93 lbs. of cyanide was spilled when a pipeline was ruptured by a large rock dislodged during road/ramp widening. **January 6, 2007:** 200 gallons of ammonium nitrate solution was spilled when a trailer rolled over and down a ditch. **2007:** A report of a release of cyanide solution onto the ground from a process pipe. Report incident 848526. **October 11, 2005:** 1,500 gallons of tails slurry containing 51 mg/L cyanide was released as a result of a pipe failure. **June 16, 2005:** 24,000 gallons of process solution containing .89 pounds of sodium cyanide spilled when construction damaged a pipeline. **May 23, 2005:** 67,500 gallons of 11.8 WAD cyanide solution (tails underdrain) spilled when a bulldozer ruptured double HDPE line. **January 2, 2005:** About 2,000 gallons of tails solution containing cyanide spilled. **January 8, 2004:** 37,500 gallons of process solution containing 0.6 pounds of sodium cyanide seeped through six locations along the tailings embankment. **May 21, 2004:** About 200 pounds of ore containing arsenic trisulfate was assumed to be released during hauling. **October 31, 2003:** About 1,200 pounds of ore containing arsenic spilled during the cleaning of trailers. **October 28, 2003:** 300 pounds of Getchell containing 3.5 of arsenic compounds spilled. **July 17, 2003:** An estimated 60,000 gallons of water containing 56 micrograms per liter of arsenic were discharged into Rabbit Creek as a result of a leak in the main supply valve. TWIN CREEKS MINE, NV - CONTINUED

Reports of pipeline failures and other accidental releases	**May 9, 2003:** 1.4 million gallons of water containing arsenic at 260 ug/L of arsenic were released as a result of pipeline break. Newmont was able to pump about 444,600 gallons back into containment. **January 21, 2003:** 500 gallons of lime with mill water solution of unknown cyanide concentration spilled due to a failed fitting on a pump. **2003:** Process columns in the mill overflowed, releasing approximately 34 pounds of cyanide.[35] **August 13, 2002:** 1,500 gallons of process solution containing 1.30 pounds of cyanide spilled when a slurry line coupler failed. **August 12, 2002:** 900 gallons of mill water with a cyanide concentration of 0.003 mg/L escaped when a hose was left unattended. **May 13, 2002:** 24,000 gallons of process solution containing 34 pounds of cyanide was released when process columns overflowed. Some of the solution made its way to Rabbit Creek and then to Kelley Creek. **April 8, 2002:** 3,500 gallons of mill water containing 0.0134 pounds of cyanide spilled when a hose was left unattended. **2002:** 24,000 gallons of cyanide solution spilled at a mining facility, as a result of an overflow of process solution from the Pinion Mill at the Twin Creeks Mine, owned by Newmont Mining Company. A Nevada official said 5,000 gallons entered Rabbit creek.[36] **January 30, 2002:** 4,000 and 30,000 lbs. of Getchell gold ore containing 8.7 and 65 lbs. of arsenic sulfide in the matrix spilled from failures in the hydraulic systems in dumping trucks. **January 8, 2002:** 1,200 lbs. of Getchell ore containing 2.6 lbs. of arsenic sulfide spilled by the roadside and discovered later. **October 24, 2001:** 3,000 gallons of barren solution containing 2.32 lbs. of cyanide spilled due to a pipeline failure. **2001:** A report of a release of an estimated 75 pounds of cyanide after the line was flushed and left open for 30 hours causing a release. The spill reached Rabbit Creek.[37] **2001:** When flushing a heap leach line the valve on the line was left open for 36 hours, releasing cyanide solution.[38] **December 8. 2000:** 1.5 tons of gold ore containing arsenic trisulfide (5%) spilled from the transport trunk from operator error, and was recovered. **November 13, 2000:** 3,000 gallons of water containing 0.27 pounds of cyanide spilled due to a frozen line. **November 1, 2000:** 1,000 gallons of reclaimed water containing 0.39 pounds of cyanide spilled due to a frozen line. **March 3, 2000:** 16 lbs. of mercury spilled when a bucket was tipped over a scissors lift. **December 28, 1999:** 500 gallons of solution containing 0.0104 lbs. of WAD cyanide spilled due to a malfunction in the filter plant. **1997:** On May 2, thousands of gallons of cyanide solution used to leach gold from crushed rocks were flushed into the desert. The mine reported 8,100 gallons.[39]

Seepage collection and treatment failures	TWIN CREEKS MINE, NV - CONTINUED The Pinon tailings impoundment formed a leak which caused a perched zone with poor water quality including high concentrations of WAD cyanide, arsenic, TDS and other constituents.[40] Water discharged to Rabbit Creek has shown occasional exceedances (by 1-10 times) of total dissolved solids and arsenic (over 10 times).[41]
Impacts to water resources	Groundwater has been degraded with cyanide, arsenic, total dissolved solids, and there have been water quality violations for arsenic in Rabbit Creek. Cyanide solution has also reached Kelley Creek.

Cortez Hills and Pipeline Mines, NV The Cortez operations, owned by the Cortez Joint Venture, are located on a combination of public (BLM) and private land in Lander County. The operations are a mix of inactive and active open pit and underground mine facilities.	
Reports of pipeline spills and other accidental releases[42]	**October 4, 2016:** 5,000 gallons of contact water were spilled due a broken valve. **August 31, 2016:** 24,000-gallon spill of infiltration water form Pipeline mine. Possible elevated arsenic levels in infiltration water. **February 24, 2015:** Barren solution release of about 2,000 gallons due to a failure of a pressure relief valve. A total of about 1.2 pounds of cyanide were released. **October 29, 2014:** About 61,172 gallons of contact water were released from a pressure relief valve that froze and cracked. Estimated amount of arsenic discharged to the environment is 0.5 lbs. **1992-1994:** Twenty-seven spills involving cyanide-containing process solution occurred between July 1992 and December 1994 at Cortez. The majority of the spills were caused by equipment failures or operator error.[43] For example, in July 1992 a ruptured line to the leach pad resulted in 50,000 gallons of barren solution being sprayed across a road and collected in a 100' x 40' gully. Twenty pounds of cyanide were released. In November 1994, a grader hit and ruptured a hose at an inactive impoundment area releasing 140,000 gal of process solution and 50 lbs. of sodium cyanide. Other noteworthy spills occurring during the period include 330,912 lbs. of slurry with a concentration of 2.8 mg/l WAD CN at the #2 thickener in February, 1994 and 256,192 gallons of toe seepage solution with a concentration of 0.042 mg/l WAD CN at tailings impoundment 6 in October, 1994. The remaining spills involved a total of between 225 and 100,000 gallons of roaster calcines, barren solution, pregnant solution, tailings material, reclaim solution and cyanide containing groundwater.[44]
Seepage collection and treatment failures	At the Cortez Mine, six monitoring wells were installed around the perimeter of Tailings Impoundments 1,2,3 and 4 in 1969.[45] These monitor wells were sampled occasionally, revealing cyanide. In 1980 an area of degraded shallow groundwater was identified downgradient of tailings impoundment 5. In the 1980's multiple monitor wells were installed, and then converted to pumpback wells to pump out the degraded water. According to the Nevada Department of Environmental Protection (NDEP) Fact Sheet, "Solution from Tailings Impoundments 1, 2, 3 through Tailings Impoundment 6 and the East and West heap leach pads is the likely cause of contamination in the shallow groundwater aquifer. Arsenic, sulfate, total dissolved solids (TDS), and cyanide are the remaining constituents of concern."[46] The fact sheet also reports that poor water quality and Profile 1 reference value exceedances were reported from Monitoring Well-09A in a 2008 report (chloride at 3000 mg/l; nitrate as N at +130 mg/l: total dissolved solids at 10,500 mg/l; sulfate at +3,400 mg/L). Final permanent closure of Pregnant Pond 2 was approved, which included the removal and appropriate disposal of all pipelines, pumps, tanks, and associated infrastructure. The site was backfilled and recontoured to promote free drainage from the site. Water quality in MW-09A has not improved since the closure.
Impacts to water resources	Groundwater degradation with arsenic, sulfate, cyanide and total dissolved solids (TDS).

Barrick Goldstrike – North Block, NV The North Block operations consist of the Betze open pit and Meikle and Rodeo underground operations. The operations are located on BLM lands and private lands north of Carlin, Nevada.	
Reports of pipeline failures and other accidental releases[47]	**July 16, 2016:** 559 gallons of process solution containing thiosulfate was spilled due to a hose failure on a sump pump. **January 2, 2016:** 3,000 gallons of "Milk of Line" was released with unknown constituents due to a level indicator malfunction on the pH control line. **August 27, 2015:** 3,000 gallons of calcium thiosulfate solution was spilled due to a hose failure on a pump. After cleanup composite soil samples still indicated "significant thiosulfate concentrations were present." **May 28, 2015:** 9,700 gallons of process water was released containing thiosulfate and possibly metals. **April 28, 2015:** About 1,700 gallons of autoclaved ore slurry containing metals was released due to a failure of a valve on a reclaim water tank **April 28, 2015:** About 11,000 gallons of tailing reclaim solution containing heavy metals was released due to operator error. **August 16, 2012:** 2,805 gallons of caron-in-leach slurry was released due to operator error. **August 18, 1996:** 4,250 gallons of reclaim water was released from Mill #2 during an unscheduled shutdown of Mill #1. The valves on top of Mill #1's reclaim water tanks failed to close causing the sumps at Mill #2 to become overwhelmed, resulting in a loss of containment.[48] **August 9, 1996:** Approximately 1,500 pounds of ammonia vapor was released from the refrigeration building through the building's ventilation system. The release was caused by the failure of a Bi-Lok type fitting on an oil tube at one of the refrigeration machines. **February 27, 1996:** 2,000 gallons of diluted cyanide (86.4% cyanide) solution was released due to a pump failure at the mill site. **February 22, 1996:** 1,000 gallons of Bio-Leach water (pH of 2.61) overflowed due to a transfer line failure. **January 15, 1991:** Approximately 200 gallons of concentrated sodium cyanide solution was released when a weld on a one-inch diameter HDPE pipeline failed. This pipeline is part of a system which delivers a concentrated sodium cyanide solution from the storage tank to the ADR facility. It was estimated that 394 pounds of sodium cyanide was released.
Seepage collection and treatment failures	**2012:** Seepage that contained cyanide at 0.018 mg/L from the North Block Tailings Facility was observed. At the time the area was trenched and the solution was pumped back into the tailings impoundment.[49] **2006:** A seep was detected downgradient of the Goldbug Refractory Ore Stockpile. The stockpile was excavated, and a flaw was discovered in the soil liner due to settling of the foundation material below. The source of the low pH seep was removed and disposed of in a contained process facility.[50]
Impacts to water resources	There is some evidence of contamination of surface water as mentioned in the Betze Pit Expansion EIS, "Two springs in the upper Antelope Creek located below old mine workings had pH values between 3.0 and 4.0 standard units."[51]

Fort Knox Mine, AK Fort Knox, originally permitted for construction and operation in 1994, is an open-pit heap leach gold mine located approximately 26 miles northeast of Fairbanks. True North is a satellite deposit. It is located primarily on State of Alaska lands and private land.	
Reports of pipeline failures and other accidental releases	**2012:** Fairbanks Gold Mining, Inc. estimates that approximately 45,000 gallons of cyanide solution were released onto the mine roadway of the heap leach operation. A heavy-equipment operator working in the area of a buried cyanide solution pipeline inadvertently damaged a 12-inch supply line with a bulldozer ripper blade.[52] **2010:** Fort Knox estimates 305,300 gallons of process water spilled. Approximately 270,000 to 275,000 gallons remained within the building, while the remaining 30,000 to 35,000 gallons spilled onto the gravel roadway and parking area.[53]
Seepage collection & treatment failure	**2012:** There was uncertainty about whether seepage from the True North waste rock dump was affecting surface water. According to a 2012 audit, "it appears that pit runoff as well as non-contact stormwater is collecting behind a portion of the reclaimed Zeppelin/Hindenburg dump in the upper Spruce Creek drainage. As a result of reclamation grading activities in that area, the upper reach of Spruce Creek has been blocked by waste material. Water, containing elevated total dissolved solids and sulfate concentrations, is ponding on the up-gradient side of the waste dump. The exact nature of this water is currently unknown, but could be water infiltrating/flowing from the pits. According to site records, a pit lake existed in the Central Pit in 2005 and 2006, but suddenly disappeared in 2007. Coincidentally, a new spring appeared in the upper reaches of Spruce Creek; a spring which ADNR believes did not exist prior to mining. It is this spring that is currently feeding the aforementioned pond. The probability is high that this water is permeating through the waste rock dump, exiting at the toe, and may be contributing to ambient water quality impacts in Spruce Creek. However, upon review of the water quality in Spruce Creek by ADEC, the agency concluded (in their findings letter dated February 5, 2010) that a correlation between the water quality in Spruce Creek and water quality effects from FGMI's mining and reclamation activities could not be established at this time."[54] Subsequent monitoring in 2012 found no correlation.
Impacts to water resources	None identified.

Pogo Mine, AK The Pogo Mine is an underground gold mine located 38 miles northeast of Delta Junction, Alaska near the Goodpaster River. The mine was permitted in 2003, and it is located primarily on lands owned by the State of Alaska.	
Reports of pipeline failures and other accidental releases	**2015:** A spill of 90,000 gallons of paste backfill occurred, releasing a mix of mine tailings and cement containing three parts per million cyanide. The spill occurred as a result of a ruptured line.[55]
Seepage collection and treatment failures	**2011:** Pogo Mine exceeded its surface water discharge limits for pH, iron, manganese and cyanide.[56] On December 11, 2011 the State of Alaska issued a notice of violation for these exceedances. The company paid a penalty for the violations, and was required to increase the capacity of the waste water treatment plant in response.[57] Investigations also found that the recycled tailings pond (RTP) was experiencing seepage. Three wells located below the RTP Dam (MW12-500, MW12-501, and MW12-502) monitor groundwater downstream of the RTP seepage collection system. Chloride, nitrate, selenium, sodium, and potassium levels in groundwater were measured above the trigger limits in 2012.[58] The company was required to conduct additional grouting in 2012 to control seepage, but excess precipitation delayed the mitigation.[59] Samples for these wells were collected monthly throughout 2013. Eight sampling events occurred in 2013 for MW12-500 when water was present in the well. Chloride and sodium were detected above the trigger limits on all sampling events and nitrate was detected above the trigger limits during 7 sampling events. Two sampling events occurred in 2013 for MW12-501 when water was present in the well. Chloride and sodium were detected above the trigger limits on all sampling events. Nitrate was detected above the trigger limits during one sampling event. Other parameters were also analyzed and compared to the Water Quality Standards. In March and June higher than normal levels of several parameters were indicated. MW11-001A and MW11-001B provide information on water quality trends down-gradient from the Dry Stack Tailings Facility (DSTF) and up-gradient of the RTP. MW11-001A is an alluvial well and MW11- 001B is a bedrock well. Samples were taken MW11-001B on March 13, May 7, June 23, September 4, and October 20, 2013. The copper and nitrate values for both wells are fluctuating over time with no apparent trend. However, the fluctuations exceed the standard.
Impacts to water resources	The mine has degraded groundwater and resulted in water quality standard violations for manganese, cyanide, iron and pH for discharges into the Goodpaster River.

Smoky Valley/Round Mountain Mine, NV The Round Mountain Mine is an open pit heap leach mine located in Nye County, Nevada approximately 55 miles north of Tonopah. It is located on private land and BLM land.	
Reports of pipeline failures and other accidental releases[60]	**April 19, 2015:** 1,077 gallons of tailings slurry spilled due to a plugged grit screen. **April 10. 2015:** An unknown amount of hydrated lime was released into the potable water system. Cause and amount are not reported. **March 17, 2015:** 9,000 gallons of tailings slurry spilled due to an air/relief valve malfunction. **January 8, 2015:** 5,925 gallons of process solution released due to a split in a pipeline. A soil sample from the spill site was analyzed at 0.021 mg/L for WAD cyanide. **September 15, 2014:** 935 gallons of cyanide solution at a concentration of 0.35 lbs./ton spilled off the R-pad containment. **September 23, 2013:** 48,510 gallons of process solution overflowed the tailings dam containment ditch and ran to the toe of the previous ramp. The cause was the removal of the barge pump and restriction of tailings discharge both necessary for new construction. **January, 28, 2013:** Approximately 300,000 gallons of mill reclaim solution was released. The solution was above standards in sulfate, total dissolved solids, WAD cyanide, manganese and arsenic at 850, 1500, 010, 0.28, and 0.14 mg/L. **December 4, 2013:** About 9,214 gallons of tailings slurry was released due to the failure of a two vacuum breaker valves under extreme cold temperatures. **June 26, 2013**: From 1,000 to 1,600 gallons of tailings reclaim process solution spilled due to a break in a pipeline during relocation. Titrated samples showed no cyanide and pH of 7.9 to 8.1. **June 22, 2013:** 2,887 gallons of process solution with a cyanide concentration of 0.04 lb./ton spilled as a result of a pipe rupture. **June 1, 2013:** 3,70 gallons of process solution containing 6.38 lbs. of cyanide spilled due to a temporary pump outage. **March 18, 2013:** 1,556 gallons of reclaim water spilled due to a failure in a pipeline. **January 27, 2013:** An estimated 202,000 gallons of tailings/mill reclaim water released from an overtopping of a small event pond. **August 20, 2012:** About 538 gallons of process solution with a cyanide concentration of 0.5 lbs./ton spilled due to a valve failure. **April 17, 2012:** 1,403 gallons of process solution containing 4.09 lbs. of cyanide spilled from a burst pipe. **December 28, 2011:** Approximately 18,200 gallons of process solution containing 8.34 lbs. of cyanide spilled due to a valve failure. **July 12, 2011:** About 1,400 gallons of a blend of fresh and reclaim water released as a result of an accidental pump shut off. **April 10, 2011:** 3,070 to 6,900 gallons of process solution containing 3.45 to 7.77 lbs. of cyanide spilled due to high flows in the process solution return ditch. **November 21, 2009:** 787 gallons of reclaim water spilled due to an air valve relief valve failure. **December 18, 2008:** 13,000 gallons of tailings thickening overflow water containing no detectable cyanide spilled due to a failure of the bypass valve.

SMOKY VALLEY/ROUND MOUNTAIN MINE, NV - CONTINUED

October 5, 2008: 592 gallons of tailings slurry at pH 7.93 spilled from a pump failure.

April 18, 2008: 748 gallons of mill tails slurry containing no cyanide spilled when a flange on a pipe blew out.

April7, 2008: About 90,000 gallons of decant water that was non-detect for cyanide spilled due to an overflow in a filter causeway.

December 30, 2007: Approximately 6,000 gallons of tailings slurry spilled when a vacuum breaker froze and broke.

November 2, 2007: 3,150 gallons of mill tailings slurry and solution containing no cyanide breached containment.

June 14, 2007: 577 gallons of reusable pregnant cyanide solution containing a total of 0.36 lbs. of cyanide spilled when line maintenance occurred.

May 19, 2007: About 5,600 gallons of solution containing 8.19 lbs. of cyanide spilled due to a blown plug on a process line.

February of 2012: Seepage that contained cyanide at 0.018 mg/L from the North Block Tailings Facility was observed. At the time the area was trenched and the solution was pumped back into the tailings impoundment.[61]

2006: A seep was detected downgradient of the Goldbug Refractory Ore Stockpile. The stockpile was excavated, and a flaw was discovered in the soil liner due to settling of the foundation material below. The source of the low pH seep was removed and disposed of in a contained process facility.[62] 37,398 gallons of mill tailings slurry with no detectable cyanide spilled due to a line rupture.

December 20, 2006: Approximately 30,000 gallons of 50/50 mill tailings and water that contained no cyanide spilled when the tails slurry line broke.

June 9, 2006: 3,727 gallons of mill tailings slurry were released due to a pipe failing from internal wear.

November 17, 2005: 5,500 gallons of tails slurry with no detectable cyanide spilled due to a broken flange.

November 3, 2005: About 16,429 gallons of sodium cyanide solution containing about 3.43 lbs. of cyanide overflowed the collection ditch.

March 7, 2005: About 10,000 gallons of cyanide solution containing about 6.61 lbs. of cyanide spilled due to a coupler failure at a leach pad.

December 5, 2004: 33,000 gallons of solution containing 43 lbs. of cyanide leaked when the lime slaker system failed from cold weather.

September 25, 2004: 7,154 gallons of pregnant carbon solution containing 0.9 lbs. of cyanide spilled when the carbon screen plugged resulting in overfilling.

August 27, 2003: 64,731 gallons of barren solution containing 60.7 lbs. of cyanide spilled as the solution breached containment from an operator error.

August 27, 2003: Greater than 500 gallons of process solution spilled due to a faulty process line.

July 19, 2003: 943 gallons of solution containing 0.16 lbs. of cyanide spilled when a fresh water line within a K5 valve box broke.

	SMOKY VALLEY/ROUND MOUNTAIN MINE, NV - CONTINUED **June 10, 2003:** 37,000 lbs. of nitric acid (70% solution) was accidentally filled into the wrong truck at Battle Mountain. The acid dissolved the welds of the tank trunk and leaked acid at the mine. **May 23, 2003:** 707 gallons of solution containing 0.003 lbs. of cyanide spilled when a tailings pump seal failed. **March 17, 2003 (date uncertain):** 1,226 gallons of solution containing about 0.92 lbs. of cyanide was spilled due to a power spike. **December 26, 2002:** 1,254 gallons of solution containing 2.23 lbs. of cyanide spilled when a ditch overflowed. **July 2, 2002:** 2,198 gallons of barren solution containing 0.13 lbs. of cyanide spilled when power was accidentally turned off. **March 11, 2002:** 620 gallons of process solution containing 0.09 lbs. of cyanide spilled due to an improper shutdown during a planned power outage. **December 12, 2001:** 748 gallons of mill tailings slurry with no detectable cyanide spilled from a failed flange on a pipeline from temperature changes. **July 28, 2000:** 6,829 gallons of barren solution containing 0.3 lbs. of sodium cyanide seeped out of primary containment due to a leaking valve on a dedicated heap leach pad. Three spills involving between 4,515 and 7,015 gallons of cyanide solution occurred at the Round Mountain mine in the period of 1992-94. Two of the spills resulted from problems with either the operation of a leach pad or flawed repairs to the leach pad. The third spill was a result of an equipment failure and operator error. See these details below.[63] **1992:** On March 18, inadequate percolation in a section of the leach pad caused ponding of leaching solution on top of the pad. A portion of the ponded solution overflowed into the collection ditch where a plug subsequently formed. As a result of the plug the ditch overflowed releasing 2,000 gallons of cyanide solution in a run 200 feet south of the pad. **1992:** On March 24, between 2,500 and 5,000 gallons of process solution containing between 11.5 and 22.9 pounds of sodium cyanide spilled - contaminating soil and a road bed. The solution leaked through the leach pad berms following operator and management error in repairs to reshape the leach lines. **1994:** In October, a spill occurred of 15 gallons of liquid cyanide solution containing 45 pounds of dry cyanide. The spill resulted when a gasket on an overfilled delivery truck burst.
Water collection and treatment failures	Monitoring wells are located along the downgradient side of the process facilities and in various other locations around the property. Analytical results are reported to NDEP quarterly and annually. For the period 2007 to the first quarter 2010, WAD cyanide concentrations ranged between 0.0124 mg/L and less than the detection limit of 0.002 mg/l – indicating groundwater impacts from cyanide.[64]
Impacts to air and water resources	Groundwater degraded by cyanide.

Turquoise Ridge, NV The operation consists of several inactive open pits and two underground mines (Turquoise Ridge and Getchell) operated by Turquoise Ridge Joint Venture. Turquoise Ridge now sends all of its ore to the Twin Creeks Mine for processing. It is located about 70 miles north of Winnemucca, NV on private lands and on public lands owned by BLM.	
Reports of pipeline failures and other accidental releases[65]	**November 23, 2013:** 7,500 gallons of dewatering water with an arsenic concentration of 0.98 mg/L spilled when a pipe repair failed. **January 10, 2011:** About 3,000 gallons of untreated mine water with an arsenic concentration of 2.5 mg/L spilled as a result of a frozen line. **April 3, 2008:** Less than 3,000 gallons of underdrain solution with an arsenic concentration of 20 mg/L spilled when an indicator failed causing a tank to overflow. **November 19, 2005:** 7,180 gallons of mine water containing arsenic spilled when an air bubble caused a dewatering line rupture. **August 4, 2005:** 5,000 to 6,000 gallons of mine dewatering water containing 2 mg/L arsenic spilled due to a leaking pipe. **May 20, 2005:** About 6,000 gallons of mine sediments sludge containing 150 lbs. of arsenic spilled when a pipeline ruptured. **December 10, 2004:** 2,500 gallons of mine water high in arsenic spilled due to an air vac failure. **October 12, 2004:** 1,000 gallons of dewatering water high in arsenic spilled from a failed AIRVAC. **October 1, 2004:** An estimated 15,000 gallons of dewatering water spilled due to a break in an HDPE pipe. The water may have contained arsenic at a concentration of 1.4 mg/L. **September 30, 2004:** 10,000 to 15,000 gallons of high arsenic mine water spilled as a result of a failed coupler. **April 5, 2004:** Less than 5,000 gallons of magnesium chloride solution spilled when the bladder containing the solution ripped. **February 23, 2004:** 4,000 gallons of treated process water spilled as a result of a line rupture. **November 5, 2002:** 750 gallons of pit water with an arsenic concentration of 0.2 mg/L spilled as a result of a cracked valve. **May 20, 2002:** Approximately 3,000 gallons of tailings underdrain solution spilled from a pump failure as a result of a wind storm. The maximum soils contamination was 0.013 mg/L for WAD cyanide. **April 2, 2002:** About 3,000 gallons of tails water with a 0.5 mg/L and 30 mg/L concentration of cyanide and arsenic respectively spilled due to a pump failure during a power outage. **March 6, 2002:** 2,000 gallons of heap leach water spilled due to a blockage in the piping. **February 20, 2001:** 1,000 gallons of heap leach pad runoff and rain water containing 0.05 mg/L WAD cyanide spilled from a broken pipeline. **February 18, 2001:** 1,000 gallons of pregnant pond water spilled. **December 20, 2000:** About 20,000 gallons of treated water containing arsenic at 10 to 15 ug/L spilled due to a factory welded lateral failure.

	TURQUOISE RIDGE, NV - CONTINUED **December 19, 2000:** 30,500 gallons of treated water containing arsenic at < 5 ug/L was released; caused unknown. **December 5, 2000:** 22,600 gallons of treated water containing arsenic at 8.5 ug/L spilled due to a split pipe. **August 16, 2000:** 900 gallons of mine water containing 1.5 mg/L arsenic spilled when a fusion coupling broke. **March 6, 1998:** 10,000 gallons of cyanide solution were released due to a power outage. **May 16, 1996:** About 480 cubic feet (100 tons) of ore slurry spilled when a tank overflowed. **March 25, 1996:** 500 gallons of solution containing 4.17 lbs. of cyanide spilled as a result of a broken plastic fitting. **May 25, 1995:** 3,000 gallons or ore slurry spilled due to a broken line. **May 16, 1995:** 6,400 gallons of process solution containing 0.3 lbs. of cyanide spilled due to a break in a pipeline as a result of construction. **May 5, 1995:** About 3,000 gallons of tailings slurry spilled when a truck ran over a pipeline. **February 2, 1995:** 4,070 gallons of slurry/cyanide mix solution containing 1.4 lbs. of cyanide spilled as a result of operator error. **January 31, 1995:** 61 tons of cyanide slurry spilled. **May 11, 1994:** Underdrain tailings solution containing 3.5 lbs. of cyanide spilled from a broken pipeline as a result of a storm event. **February 22, 1994:** 25 tons of overflow slurry/cyanide solution with a cyanide concentration of 0.11 lbs./ton spilled from a neutralizer tank. **February 1, 1994:** Approximately 20,000 gallons of barren solution spilled when the pipeline came apart. **October 27, 1993:** 25,500 gallons of process solution containing 0.855 lbs. of cyanide spilled as a result of an overload of ore in the circulating part of the grinding circuit. **August 3, 1993:** 22,800 gallons of 18.3 mg/L cyanide solution spilled due to a faulty subdrain. **July 17, 1993:** 36,000 gallons of pregnant solution containing 6.4 lbs. of cyanide spilled when a perimeter ditch became plugged.
Seepage collection and treatment failures	None documented.
Impacts to water resources	None documented. There are no perennial streams in the project area.

Bingham Canyon Mine, UT The Bingham Canyon mine is an open pit, copper, gold, silver and molybdenum mine located 28 miles southwest of Salt Lake City, Utah. It is the largest open pit mine in North America.	
Reports of pipeline failures and other accidental releases	**2011:** Report of malfunction of equipment that allowed the release of approximately 145,424 gallons of copper tailings.[66] **2011:** Report of pipeline overflow onto soil with estimated 100,000 – 290,000 gallons of copper tailings material released from pipeline.[67] **2011:** Report of tailings slurry released from tailings slurry hot box. 160,000 gallons of tailings released.[68] **2010:** Report of a release of process water due to broken pipeline. **2010:** Report of a discharge of sulfuric acid from a pipeline in the precious metal plant released between 4,000-5,000 gallons.[69] **2007:** Report of a release of 35,000 gallons of hydromet tails containing arsenic due to pipeline break.[70] **2007:** Report of 1,240,000 gallons of process water containing arsenic from pipeline break due to cold temperatures. [71] **2006:** Report of 270,000 gallons of process water released because of pump failure, which resulted in overflow of containment area.[72] **2006:** Report of 660,000 gallons of process water containing arsenic released due to cracked pipe.[73] **2006:** Report of 1,000,000 gallons of process water released from the Magna Reservoir due to a failed level indicator.[74] **2004:** Report of 4,000,000 gallons of process water with arsenic from pipeline.[75] **2004:** Report of 2,000,000 gallons of process water with arsenic from broken process water line.[76] **2004:** Report of 202,000 gallons of process water released due to pipeline failure.[77] **2003:** Report of 70,000 gallons of process water with arsenic released due to pipeline failure.[78] **2003:** Report of 70 tons of copper concentrate released from pipeline.[79] **2003:** Release of copper concentrate, containing 340 pounds of arsenic, 20,000 pounds of copper, and 200 pounds of lead.[80] **2003:** Copper concentrate pipeline ruptured, releasing 240,000 tons of copper, 428 tons of arsenic, 253 tons of lead.[81] **2002:** Report of 5,800 gallons of process water from slag pot cooling area due to plugged drain line.[82] **2001:** Report of tailings pipeline failure, releasing 4 pounds of arsenic, 14 pounds of chromium and 1 pound of lead.[83] **2000:** Report of 110 tons of ore slurry released due to a leak in ore line.[84] **2000:** Report of 18,000 tons of sulfuric acid released from pipe due to flange failure.[85] **1999:** The process water pipeline sprung a series of leaks in 1989 and 1999. It has been estimated that 100 million gallons of process water with high arsenic levels spilled before the leak was discovered.[86]

	BINGHAM CANYON MINE, UT - CONTINUED **1998:** Report of copper sulfate released into a canal. **1998:** Report of clogged piping system causing pipe to back up and overflow releasing acid rock drainage into water. **1997:** Report of settling pond overflow due to clogged outlet valve. Release of copper sulfate into water. **1997:** Report of pipeline rupture releasing process water (pH 2.5-4.0) into water. **1993:** Report of 45,000 gallons of wastewater spilled due to a rupture of the transfer line.[87] **1991:** Report of 30,000 gallons of industrial wastewater spilled at the wastewater treatment plant due to line break.[88]
Seepage collection and treatment failures	**2011:** Noncompliance in April-June 2011 for discharges of copper, zinc and total suspended solids at copper smelter.[89] Wastewater from the mine has escaped the site's collection system, contaminating groundwater with acid, metals and sulfates. The groundwater plume extends towards the nearby Jordan River and covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[90] There have been multiple tailings spills.[91] Drainage from the waste rock piles will require water treatment in perpetuity to prevent additional groundwater pollution.[92] In February 2008, the United States Fish and Wildlife Service took legal action against Kennecott for the release of hazardous substances from the mine's facilities, including selenium, copper, arsenic, lead, zinc and cadmium.[93] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that serve as fish and wildlife habitats. According to the federal biologists, the release of these hazardous pollutants has harmed natural resources, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.[94] Soils and sludge are contaminated, as are surface water and groundwater, which affect wetlands between the site and the shore of Great Salt Lake.[95]
Impacts to water resources	Wastewater from the mine has escaped the site's collection system, contaminating groundwater with acid, metals and sulfates. The groundwater plume extends towards the nearby Jordan River and covers more than 72 square miles – rendering water for thousands of Salt Lake City residents undrinkable.[96] Groundwater contaminated by mine operations has been released from the mine site through artesian springs into areas that harm natural resources. This includes fish and wildlife habitats, including migratory birds and their support ecosystems, which includes wetlands, marshes, freshwater wildlife habitats, playas and riparian areas and freshwater ponds.

Hycroft Mine, NV (Crowfoot-Lewis) The Hycroft Mine is an open pit heap leach gold and silver mine located within a 14,753 – acre mine boundary on public land administered by the BLM and private land. Hycroft was formerly known as the Crofoot-Lewis open pit mine, which was a small heap leaching operation that commenced in 1983.	
Reports of pipeline failures and other accidental releases[97]	**July 27, 2016:** 3,117 gallons of pregnant solution, containing 0.39 lbs. of cyanide, spilled due to a pump failure. **April 8, 2016:** 2,500 gallons of process solution spilled when a pipeline broke. **February 11, 2016:** About 1,000 gallons of process solution, with a cyanide concentration of 0.17 mg/L, spilled when a hose gasket on a pump failed. **January 14, 2016:** 600 gallons of process solution, containing 0.67 lbs. of cyanide, spilled as a result of a broken vacuum breaker on a pump. **January 11, 2016:** 16,830 gallons of process solution spilled as a result of a broken line. **January 10, 2016:** An estimated 1,200 gallons of process solution, with a cyanide concentration of 0.29 lbs./ton, spilled due to an insecure 8-inch HDPE pipe at the North Event Pond. **January 5, 2016:** Approximately 6,000 gallons of process solution, containing 3.12 lbs. of cyanide, spilled when a closed valve created excessive internal pressure causing a weld to fail. **October 20, 2015:** Mining impacted storm water was released. The water had a pH of 2.9 to 3.1. **March 30, 2015:** Process water was released. There is no additional information on this event. **July 8, 2015:** An estimated 1,402 gallons of process water, containing 4 lbs. of cyanide, spilled when an 8-inch HDPE pipe pulled loose. **January 16, 2015:** About 2,400 gallons of process solution, with a cyanide concentration of 0.03 lbs./ton, spilled from an uncapped abandoned pipe. **January 10, 2015:** An estimated 2,000 gallons of process solution containing 0.834 lbs. of cyanide spilled from a failed feed line hose. **November 18, 2014:** 596 gallons of process solution containing cyanide at 0.13 lbs./ton spilled when a power pump caused the B side pump to trip, hence losing power. **November 6, 2014:** 7.5 gallons of 30% sodium cyanide solution containing 21.7 lbs. of sodium cyanide spilled from a broken line. **1994:** On December 4, the facility reported a spill of approximately 30 gallons (or 100 pounds) of liquid sodium cyanide with a concentration of approximately 30 percent cyanide. The spill was the result of a mechanical failure on a delivery truck.[98] **1990:** The facility experienced problems associated with electrical power interruptions compounded by record sub-zero temperatures. During the hours of 6 p.m. to midnight on December 20, 1990, sub-zero temperatures (near -20 F), combined with two separate power interruptions by Sierra Pacific Power, resulted in several frozen lines on the leach pads. As a result, four header system failures on Pad 1 and one header system failure on Pad 2 occurred. The blow-out on Pad 2 discharged 1.7 pounds of sodium cyanide contained in 5,000 gallons of solution into a man-made 100-year storm drainage ditch between Pad 1 and Pad 2. The freezing leach lines discussed in Incident No. 2 resulted in a gradual raising of solution storage pond levels to the extent that an estimated total of 300,000 gallons containing 100-150 pounds of sodium cyanide flowed from the low-pregnant pond to an earth lined containment dike. Two separate flows occurred - one on December 24, 1990 (estimated 228,000 gallons) and the other on December 27-28, 1990 (estimated 72,000 gallons). These flows contained 76 pounds and 24 pounds of cyanide, respectively.

Water collection and treatment failures	HYCROFT MINE, NV (CROWFOOT-LEWIS) - CONTINUED In April 2004, it was noted that in the shallow perched aquifer that underlies the Crofoot Heap Leach pad various constituents of concern exceeded Nevada Division Profile I RVs at various sampling points [e.g., selenium (SP-27 and SP-30), WAD cyanide (SP-18 and SP-28), mercury (SP-25 and SP-30), and nitrate (SP-30)]. Although SP-30 showed exceedances for selenium (1.9 mg/L), mercury (0.017 mg/L), and nitrate (18 mg/L), cyanide was at less than detectable levels (<0.005 mg/L). As of the fourth quarter of 2016, the influence of process solution is still evident in shallow investigation wells SP-25 and SP-30. Well SP-25 shows concentrations of mercury at 0.04 mg/L and nitrate at 13 mg/L, and well SP-30 has mercury concentrations of 0.012 mg/L.[99]
Impacts to water resources	Water quality standards for cyanide, mercury selenium and nitrates have exceeded water quality standards in groundwater. The only perennial surface water occurrence that exists within the area is approximately 2 miles to the west of the project, consisting of shallow duck ponds.[100]

Marigold Mine, NV The Marigold Mine is an open pit gold mine, which was initially authorized in 1998. It is located 3 miles south of Valmy, NV on private land and public BLM land.	
Reports of pipeline failures and other accidental releases[101]	**May 23, 2013:** 58,000 gallons of process solution containing 48 lbs. of sodium cyanide was released due a weld failure in a 10-inch HDPE pipe. **February 8, 2012:** 5,000 gallons of barren solution containing 6.9 lbs. of cyanide was released when header feeding line broke. **May 28, 2005:** 400 gallons of process solution was spilled due to a defect in a flange connecting two HDPE pipes. **May 19, 2005:** 30 gallons of process solution was spilled as a result of the failure of two HDPE pipes. **December 8, 2004:** Solution from a carbon-in-leach area breached containment. The final report does not indicate the volume of the spill. However, given the effort involved in developing the final cleanup report the volume is likely to be have been very large. **November 17, 2004:** About 1,100 gallons of barren solution containing 0.413 lbs of cyanide was released due to a leaking buried line. **June 24, 2004:** Approximately 3,000 gallons of barren solution with a sodium cyanide concentration of 0.1 lbs./ton was spilled when an excavation struck a process pipeline. **April 14, 2004:** 5.940 gallons of heap leach pregnant solution containing 0.743 lbs of cyanide was spilled as a result of line damage from an excavation. **March 22, 2004:** 3,191 gallons of process solution containing 0.065 lbs. of cyanide was spilled as a result of a rupture in a process line from an excavation. **July 26, 2002:** 5,000 gallons of cyanide solution containing 7.39 lbs. of cyanide was released from a pipeline failure. **June 20, 2002:** 800 gallons of heap leach barren solution containing 0.67 lbs. of cyanide was released due to a burst feed line. **April 16, 2002:** 2,712 gallons of barren solution containing 0.34 lbs. of cyanide was spilled due to a failed screen. **January 17, 1993:** 10,000 to 20,000 gallons of containing 1.9 lbs. of sodium cyanide was released due to a frozen pipeline. **April 3, 1991:** About 3,00 gallons of tailings solution containing 4.9 lbs. of cyanide was released when a tailing line broke.
Seepage collection and treatment failures	**2000:** According to 2000 DEIS for the Marigold Mine expansion, the current tailings impoundment is leaking water at a rate of about 34 gpm at the north end, down from the 1991 seepage of 110 gpm. The seepage is elevated in TDS and chloride relative to Nevada drinking water standards and is elevated in background levels of these constituents in groundwater.[102]

Seepage collection and treatment failures	MARIGOLD MINE, NV - CONTINUED **1992:** It was discovered that the tailings impoundment was seeping tailings fluid into the vadose zone near the decant tower on the northern side of the facility. Monitor wells were installed in the vadose zone and the alluvial aquifer north of the tailings to determine the extent of the seepage plume, and monitor its impact on the aquifer. The pH of the seepage plume ranges from 6.2 to 7.5 and is somewhat more acidic than the alluvial groundwater. TDS is elevated in the seepage plume with values in the range of 500 to 1,000 mg/l. Chloride is also elevated. WAD cyanide ranges from 0.01 to 0.15 mg/l staying with the Nevada water quality standard of 0.2 mg/l. Although the seepage plume has reached alluvial groundwater at monitor well TDOH-12U, the water quality in that well is within drinking water standards. Leakage initially observed in 1991 was estimated 190 gpm. In 1992, monitoring indicated that the rate was 110 gpm.[103]
Impacts to water resources	The mine has degraded the groundwater aquifer with total dissolved solids (TDS), chloride and cyanide.

Buckhorn Mine, WA The Buckhorn Mine is an underground gold mine located in northeastern Washington. It began operations in 2008. Ore is processed off-site at the Kettle River Mill in Republic Washington.	
Reports of pipeline failures and other accidental releases	2012: A truck carrying concentrated wastewater from the Buckhorn Mine crashed and spilled about 4,200 gallons into Marias Creek.[104] The wastewater contained nitrates and sulfates.
Seepage collection and treatment failure	Concentrations of mine-related contaminants have increased over time at certain surface water, groundwater, spring, and seep locations since mining was initiated.[105] The three primary reasons for the increases are intended or unintended discharge of inadequately treated wastewater, seepage of mine water from the underground mine, and the possible onset of acid drainage from the weathering of sulfide ore and mined materials, including underground workings, development rock, and ore.[106] **2012:** A $395,000 fine was issued from the Department of Ecology for repeated and continued water quality violations. The groundwater capture zone failed to contain spring rains and snow melt, resulting in contaminated water reaching Gold Bowl Creek.[107] According to a news article, "In the first five years, the state agency issued six notices of violation, two civil penalties and six administrative orders, the hearings board ruling states."[108] Also in 2011, Ecology determined that discharges of treated mine water created slope instability and triggered a landslide that impacted a small stream below the mine.[109] **2010:** In September 2010, Kinross reported that misconduct by treatment plant staff had resulted in unreported discharges that exceeded permit limits for ammonia, nitrate, TDS, arsenic, zinc, and pH between May 2009 and August 2009.[110] **2009:** Washington Department of Ecology issued a $40,000 fine for a violation of its water quality permit for failing to adequately capture and treat water from the mine operation.[111] Notice of Violation 6965 was issued for exceeding Total Dissolved Solids effluent and stormwater limits. Notice of Violation 7031 was issued for 7 water quality exceedances in outfalls in April, May and June 2009. Notice of Violation 7080 was issued for 57 water quality exceedances for zinc, copper, lead and TRC effluent limits.[112] **2007:** Washington Department of Ecology issued a $62,000 penalty over issues including stormwater discharges and slope failures during mine construction. Administrative Orders were related to failure of the treatment plant to properly remove contaminants and failure to adequately capture water potentially affected by the mine.
Impacts to water resources	The mining operations have degraded water quality in Gold Bowl Creek, Marias Creek, South Fork Nicholson Creek and Upper South Fork Bolster Creek as well as groundwater, seeps and springs downstream and downgradient of the mine.[113] The Washington State Department of Ecology (Ecology) has issued numerous Notices of Violation (NOVs) and Administrative Orders (AOs) to Kinross. The water quality violations were for exceedences of TDS, TSS, ammonia, arsenic, chloride, copper, lead, mercury, and zinc, as well as pH values that were higher than the permit limit of 8.5.[114]

Jerritt Canyon Mine, NV The Jerritt Canyon Mine has been in operation since 1980. The primary commodities mined are gold and silver from underground and open pit mining and heap and vat leach processing operations. It is located approximately 46 miles north of Elko in the Independence Mountain Range on federal lands managed by the Forest Service and BLM, and private lands.	
Reports of pipeline failures and other accidental releases[115]	**December 6, 2015**: About 5,000 gallons of tailing facility seepage for the East Lined Pond spilled as a result of failed transformers. **September 1, 2015:** Approximately 18,000 gallons of seepage water escaped from the East Line Pond when a pump failed resulting in an overflow. The seepage was very high in total dissolved solids and chloride, and elevated in antimony, arsenic, magnesium, manganese, mercury, and total nitrogen. **April 29, 2015:** 1,000 gallons of reclaim water of was spilled as a result of a corroded pipe. The water was very high in total dissolved solids and chloride, and elevated in lead, manganese, magnesium, mercury, and sulfate. **February 14, 2015:** 4,000 gallons of process solution was released when a transfer line to one of the heap leach carbon column blew apart. **January 2, 2015:** 2,000 gallons of process solution was released from a seepage well when a flow check valve froze. The solution was high in total dissolved solids, chloride, arsenic, and manganese. **January 2, 2015:** 6,000 gallons of process solution (unknown concentrations) was released from a failure of a pump in the west seepage system causing overflow in the East lined pond. **January 1, 2015:** 2,000 gallons of process solution was released from a seepage well when a flow check valve froze. **December 12, 2014:** About 500 gallons of process solution was spilled due to a failure of a discharge pump line. **November 28, 2014:** 800 to 1,000 gallons of process solution (unknown concentration) was released from a sump pump failure. **December 8, 2013:** Unknown volume of seepage recovery water from Tailings Facility I was spilled which was high in total dissolved solids and chloride **November 7, 2013:** Approximately 450 gallons of process solution was spilled due to an overwhelmed overflow pump. The solution was high in total dissolved solids, sulfate, chloride, antimony, arsenic, magnesium, mercury, nitrate (total N), and selenium. **August 11, 2013:** An estimated 90,000 gallons of Tailings Storage Facility (TSF-1) seepage water was released due to a weld failure in the seepage return line. The solution was high in total dissolved solids, chloride, antimony, and manganese. **July 28, 2013:** An estimated 1,500 gallons of process slurry with a cyanide concentration of 0.003 mg/L was released when a line on the discharge side of the thickener pump came apart. **July 25, 2013:** About 300 gallons of process slurry with a cyanide concentration of 0.003 mg/L was released when a line on the suction side of the thickener underflow came apart. **July 1, 2013:** 1,000 gallons of carbon-in-leach solution containing 0.009 lbs. of cyanide was spilled due to excessive tank pressures on the concrete floor and access road. **June 20, 2013:** 10 pounds of elemental mercury spilled from scrubber solution lines from operator error.

JERRITT CANYON MINE, NV - CONTINUED

November 21, 2012: About 1 pound of mercury was found 1.5 feet below the ground surface and was considered to be a historical release.

September 18, 2012: A calculated 10,080 gallons of solution from the WSR-W storage reservoirs which have total dissolved solids that average 20,000 mg/L. The cause of the leakage was unknown.

September 18, 2012: Roughly 5 pounds of mercury spilled near the toe of the Tailings Facility I adjacent to the Splitter Box Pond. The release appears to have come from a piping that originally carried mill tailings.

September 28, 2011: Cyanide solution with a concentration of 10 mg/L of an unknown amount spilled and the source was unknown.

December 3, 2010: 43,000 gallons of seepage water at 13,500 mg/L total dissolved solids was released when a pipe separated from a joint.

October 3, 2010: 10,200 gallons of Tailings Facility water containing cyanide and arsenic spilled when a sample port was left open.

July 22, 2010: About 170,000 gallons of seepage water from the mill was released (Spill Report 110923-02) resulted in a Finding of Alleged Violations issued on August 17, 2011.[116] The spill occurred due to a corroded bolt flange failure on a buried pipe located outside of the Wet Mill. The water was extremely high in total dissolved solids (~28,000 mg/L) and chloride (~10,000 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, magnesium, manganese, mercury, selenium, sulfate, and thallium. Analysis indicated that the groundwater in the mill area was degraded by a multiple discrete sources of process solution. Data from groundwater monitoring wells located downgradient of the release showed that this release was a partial contributor to the groundwater degradation with respect to chloride, TDS and other constituents.[117] Elevated cyanide concentrations observed in several wells indicated that a release from a source of cyanide-rich process solution unrelated to tailings seepage solution. Upon further investigation, the source of the cyanide release was determined to be from the secondary containment for the Liquid Cyanide Storage Tank.

May 30, 2010: About 90,000 gallons of seepage reclaim water containing mercury, arsenic, cyanide, and thallium was released as a result of a broken weld at the flange adapter on the south seepage line. The water was extremely high in total dissolved solids (~20,700 mg/L) and chloride (~11,500 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, magnesium, manganese, mercury, selenium, sulfate, and thallium.

November 8, 2009: 2,500 gallons of process solution containing 20.5 mg of cyanide and 0.01 pounds of arsenic spilled from a leaking valve.

August 27, 2009: Approximately 5,000 gallons of cooling pond process solution was released as a result of a leaking valve.

August 26, 2008: Drain down fluid from the Coffee heap leach pad spilled when construction activity pulled a drain line loose. The amount and concentrations were not known.

December 3, 2007: About 30,000 pounds of gold ore containing 1,500 pounds each of arsenic and mercury was spilled due a vehicle accident.

November 28, 2007: About 1,000 gallons of tailings seepage water spilled due to a failed pipe fitting.

September 9, 2007: About 25,000 pounds of Pete ore containing < 5% arsenic and mercury was spilled when a trailer rolled from driver inattention.

	JERRITT CANYON MINE, NV **August 9, 2006:** Approximately 2,000 gallons of seepage water was released when a motor grader punctured a partially buried seepage pipeline. The seepage water exceeded Profile I levels for chloride, sulfate, magnesium, total dissolved solids, manganese, selenium, and thallium. **August 5, 2005:** 71,000 gallons of tailing slurry overflowed the tailing overflow catchment pond due to a weld failure on a discharge pipeline. The water was extremely high in total dissolved solids (~19,000 mg/L) and chloride (~9,300 mg/L), and above Profile I reference values for antimony, arsenic, cadmium, WAD cyanide, magnesium, mercury, nickel, nitrate, selenium, sulfate, and thallium. **February 10, 2005:** 30,000 gallons of Cooling Pond Quench Pond Lime solution was released as a result of a failing weld on a "Y" connection. The solution was high in arsenic. **January 13, 2005:** 5,700 gallons of tailing seepage water containing elevated levels of arsenic, chloride (8,500 mg/L), manganese, mercury, and total dissolved solids (20,000 mg/L) was released when an equipment blade from snow removal struck a pipeline. **2000:** A report of eight pounds of arsenic released from a lined pond and partial out of a cooling tower due to pump failure.[118] **May 26, 1996:** 1,000 gallons of process slurry flowed out of the chlorination building after a tank valve was inadvertently left open during maintenance operations. The slurry flowed out of the east doors and into the milk of lime containment area. The slurry contained approximately 0.03% (3.2 lbs.) of sodium hypochlorite.[119] **January 11, 1996:** Jerritt Canyon experienced a power bump at the mill resulting in the overflow of a heap leach carbon column. The power bump disabled the pump at the end of the heap leach carbon column train, while the feed pump remained operating. Barren solution overflowed the last carbon column in the train and flowed out of the building into the driveway area, and into a ditch that drains to the tailings line drainage pond. Approximately 2,500 gallons of barren solution flowed onto the ground and into the ditch. The solution contained approximately one pound of cyanide. **August 21, 1995:** The south chlorination tank #2 ruptured, resulting in approximately 2,000 gallons of slurry.[120] **1995:** Jerritt Canyon experienced a rupture in the south tailings slurry line. The rupture occurred at a fatigued joint in the pipeline, approximately 100 yards west of the tailings line drainage pond and 50 yards north of the tailings dam. An estimated 2,400 gallons of tailings slurry was discharged to the road and surrounding ground surface. Less than 10 pounds of cyanide was involved in this spill. **1989:** 20,000 gallons of cyanide released.[121]
Seepage collection and treatment failures	The tailings generated from the vat leach operation were responsible for creation of a cyanide plume in groundwater. Exceedances of chloride, TDS, arsenic and sulfate were also observed in wells downgradient of the tailings impoundment. The tailings impoundment was lined and had seepage control features, but these were not adequate to prevent groundwater contamination. In 1991, a cyanide plume was detected from tailings pond. From 1993-2004, groundwater monitoring wells downgradient of the tailing impoundment showed exceedances for Cl and TDS consistently from 1993-2004.[122]

	JERRITT CANYON MINE, NV - CONTINUED According to the mine's recent discharge permit review, contamination from TSF-1 leakage has degraded groundwater with respect to chloride and TDS (and in some cases with antimony, arsenic, cadmium, magnesium, manganese, mercury, nitrate, selenium and WAD cyanide).[123] Four waste rock disposal areas (Marlboro Canyon East, Gracie, Snow Canyon, and DASH East) all exhibited seepage from the toe slope. The quality of the seepage water has been shown to exceed the 500 mg/l total dissolved solids (TDS) standards for the South Fork Owyhee River, due primarily to high sulfate and magnesium concentrations. The State of Nevada has been working with the Permittee to address these seepages since the 1990s.[124] In 2004, routine sampling of the lower Sheep Creek drainage indicated elevated sulfate, TDS, and magnesium concentration as a result of seepage emanating from the DASH East RDA UDS. Drainage from the toe of the East DASH waste rock disposal area into Sheep Creek exceeded the 500 mg/L TDS reference value for the North Fork Humboldt River due to elevated sulfate and magnesium concentrations.[125] Both Sheep Creek and the NF Humboldt have been incorporated into the State of Nevada 303(d) List of Impaired Waters — Sheep Creek for TDS and the NF Humboldt for total phosphorous and dissolved oxygen. Precipitation infiltrating through the angle of repose slope along the lower lift of the East DASH waste rock disposal area was previously believed to be contributing to the elevated sulfate, magnesium and TDS concentrations present in the seepage solution emanating from the toe of the East DASH disposal area. This seepage discharge entered Sheep Creek which flows through an under-dump drain constructed in the bases of both the Northwest DASH RDA and the East DASH RDA. Sheep Creek is a tributary of the NF Humboldt and on occasion, surface flow from the Sheep Creek has reached the NF Humboldt. As a point of reference, flow in Sheep Creek would travel a distance of seven (7) miles from the toe of the DASH waste rock disposal area to its confluence with the NF Humboldt.[126] In June of 2008 groundwater was found to contain volatile organic compounds in four monitoring wells. Four wells contained trichloroethane and three of the wells exceeded the Nevada State action level for trichloroethane. The trichloroethane levels ranged from 2.3 to 1,360 micrograms per liter. Chloroform was found in three of the wells from 68 to 1,320 micrograms per liter.[127]
Impacts to water resources	Water quality standards in groundwater have been exceeded for chloride, arsenic, sulfates, total dissolved solids and trichloroethane, and groundwater has been degraded by cyanide and in some cases antimony, cadmium, magnesium, mercury, nitrates and selenium. Surface water has been degraded in Sheep Creek, North Fork Humboldt River and South Fork Owyhee.

Kensington Mine, AK The Kensington Mine, permitted in 2005, is an underground mine using flotation process to recover gold. It is located in southeast Alaska on private and federal lands in the Tongass National Forest, approximately 45 air miles north of Juneau.	
Reports of pipeline failures and other accidental releases	2005: In October a piece of drilling equipment fell and released drilling fluid into Slate Creek Cover, north of Juneau.[128] **2005:** In August, kerosene spilled at Comet Beach, and about 2 gallons of diesel spilled into Slate Creek Cove in September.[129]
Seepage collection and treatment failures	**2013:** A 2013 inspection report identified acid mine drainage occurring at the north end of Lower Slate Lake.[130] The pH was usually 4 or 5, with one point as low as 2. The mine collected water samples and sent them to the lab for analysis. The acid mine drainage is coming from rock that was excavated during the phase 2 construction of the dam last summer. Some of the acid generating material was mixed with other fill for unknown reasons during last summer's construction of the second stage of the downstream dam raise, and placed into a non-lined area of the tailings facility. Water quality tests showed that the resulting drainage from the area contained high levels of metals and a low pH.[131] Acid drainage was noticed by Coeur staff when the snow cover melted from the tailings facility in late spring 2013. Acid generating material had been accidentally placed as fill at the north end of the tailings facility after being excavated from near the dam while preparing the foundation for the Stage II lift. Attempts to seal the seeping water from cracks and holes in the shotcrete were ineffective. A small water treatment plant was built to treat the water being collected from the seeps, however a September inspection found that water quality was still being degraded in Lower Slate Lake, and speculated that not all the fill material had been removed.[132] **2006-2010:** EPA issued a $140,000 fine for CWA violations over mine discharges. Water quality violations were issued for violating water quality standards for manganese, zinc, aluminum and cadmium. Acid mine drainage was released into East Fork Slate Creek during construction between 2006 and 2010.[133] According to a report in the Juneau Empire in 2008, the mine operator had records of water quality violations dating back to March 2007, but didn't inform the agencies until December of that year.[134]
Impacts to water resources	Acid mine drainage has degraded water quality in Lower Slate Lake, and mine discharges have caused water quality violations for manganese, zinc, aluminum and cadmium in East Fork Slate Creek. Water treatment in perpetuity will be required due to acid mine drainage.

Mesquite Mine, CA The Mesquite Mine is an open pit cyanide heap leach mine located in at the southern end of the Chocolate Mountains on public lands, state lands and private lands approximately 33 miles east of Brawley, CA.	
Reports of pipeline failures and other accidental releases	**February 1, 2017:** An estimated 5 gallons of process solution was released off containment.[135] **April 4, 2015:** 525 gallons of diesel fuel spilled off containment.[136] **August 12, 2015:** 500 gallons of hydraulic oil spilled off containment due to mechanical failure on hydraulic fitting on shovel. **August 14, 2015:** estimated 100 gallons of hydraulic oil were spilled off containment.[137] **August 19, 2015:** 25 gallons of process solution containing .011 lbs. of cyanide were spilled off containment.[138] **June 27, 2014:** 11.13 gallons of cyanide solution escaped containment on the north east side of heap leach pad #6. **August 19, 2014:** 25 gallons of process solution was spilled off containment.[139] **October 14, 2014:** a fueling hose came disconnected from a haul truck and subsequently leaked 100 gallons of diesel fuel off containment. **2014:** 11.13 gallons of cyanide solution escaped containment on the heap leach pad. **2014:** A fueling hose came disconnected and leaked 100 gallons of diesel off containment.[140] **1990:** Leaching solution (770, 50, 2,520, 33, 26 gallons)[141] **1990:** Pregnant solution (52 gallons) **1989:** Pregnant solution (4,000 gallons) **1986:** Goldfields Operating Co., Mesquite CA, Leaching solution (amount unknown)[142]
Seepage collection and treatment failures	None identified.
Impacts to water resources	None identified. The closest perennial surface water feature is the Coachella Canal, approximately 15 miles southwest of the site.[143]

Bald Mountain Mine, NV Bald Mountain Mine is an open pit mine located 65 miles northwest of Ely on private and BLM lands.	
Reports of pipeline failures and other accidental releases[144]	**September 15, 2016:** 3500 gallons of (0.029g/ton) of cyanide solution spilled with a total release of 0.435 lbs. The release resulted from a strut off valve failure. **September 27, 2007:** 610 gallons of cyanide at 0.03lb/ton spilled due to an **Inadvertent carbon column overflow.** **March 12, 2005:** 12,000 gallons of magnesium chloride solution of unreported concentration released to soil. **February 8, 2002:** 500 gallons of cyanide solution at 0.08mg/L concentration released due to a frozen pipe. **February 17, 2001:** Approximately 14,000 gallons of heap drain down solution released with a cyanide concentration of about 0.08 mg/L. The cause was a frozen pipe. **December 3, 1998:** 10,000 gallons of cyanide solution at 0.62 mg/L was spilled due to a broken solution line. **September 8, 1998:** Storm water release of 3,000 gallons from a leach pad with trace amounts of cyanide. **February 8, 1998:** 4,000 gallons of cyanide solution (barren solution and heap material) of a total release of 3.3 lbs. released due to a heap pad failure. **June 22, 1997:** Approximately 38,000 gallons of 0.22 lb./tons of cyanide solution was spilled as a result of a 2 inch plug becoming undone from a threaded coupler on a 10 inch header pipe. **January 6, 1991:** 5,000 gallons of sodium cyanide solution containing 4 pounds of cyanide were spilled due to a loose check valve; a maintenance operator had failed to tighten the bolts. The spill affected 50 square yards of soil to a depth of 4-8 inches. About half of the solution was pumped back into the system. The remainder froze in place and was to be removed for placement on the heap. Follow up soil sampling confirmed low cyanide levels.[145] **September 14, 1989:** Process solution release at a 10 mg/kg of unknown quantity **1989:** Barren solution 9,000 gallons.
Seepage collection and treatment failures	None identified.
Impacts to water resources	None identified. There are no perennial streams in the project area.[146]

Golden Sunlight Mine, MT The Golden Sunlight Mine is an open pit, cyanide leach mine operated on BLM and private lands in Montana, approximately five miles northeast of Whitehall, Montana. The BLM issued its plan of operations in 1982.	
Reports of pipeline spills and other accidental releases	2006: A spill of approximately 560 gallons of cyanide solution occurred on January 6, 2006 as a result of a displaced hose at the Slaker Building.[147] **2000:** Golden Sunlight reported two recent cyanide leaks, one occurred as a result of a failed vat leach tank, leading to the release of 390,000 gallons of cyanide solution and another prompting a 2,020-gallon discharge. The spills occurred on Aug. 31 and Oct. 26, respectively.[148] **1998:** Golden Sunlight reported a cyanide spill on Sept. 2 to the Montana Department of Environmental Quality. Mine officials said the leaks, which migrated to several ground-water wells at the mine site, occurred between June 1 and July 21. Cyanide was detected in five of six ground-water wells, with levels of cyanide reaching as high as between 30 and 39 parts of cyanide per million parts of water. The state water-quality standard for cyanide is 0.005 parts per million. The mining company did not notify the agency of the spill until a month after it occurred. The company did not have pumpback wells on site to address the spill[149] **1994:** 48.3 tons of tailings were spilled due to a leak in the spare tailings line. State agencies were not notified for many months. A notice of noncompliance was issued for failure to notify the agency and conduct required cleanup activities.[150] **1991:** 60 pounds of cyanide spilled due to tailings line leak causing soil contamination.[151] **1989:** A pipeline blockage caused acid mine drainage to discharge onto the ground.[152] **1988:** A pipeline leak occurred sometime between March 31 and April 5 before it was discovered by the company. Approximately 15,000 gallons of mine waste flowed from the emergency spillway.[153] **1987:** A cyanide slurry spill occurred. Estimated that the spill included 60 pounds of cyanide. **1986:** A pipe fitting split and discharged approximately 2000 gallons of cyanide solution.[154]

Seepage collection and treatment failures	GOLDEN SUNLIGHT MINE, MT - CONTINUED **2013:** Montana Department of Transportation submitted a letter to the Montana Department of Environmental Quality asserting that Golden Sunlight has degraded groundwater quality at the MDT Whitehall facility at least since 1993, a period of 20 years. The agency attributes the source of groundwater quality degradation to the discharge from the nearby mine tailings impoundment.[155] **2004:** According to the 2004 Supplemental Environmental Impact Statement, various reports describe the failure to capture seepage from the tailings impoundment.[156] Despite continual upgrading of the wells, seepage is escaping the south pumpback system. Data suggest slow migration of seepage away from Tailings Impoundment No. 1 (GSM 1998, 1999, and 2000 annual reports). There also is a vertical component to the seepage migration as well (GSM 2000 annual report). Keats (2001) concluded the second and third rows of pumpback wells were not completely capturing the seepage. Keats recommended treatment at the source area rather than adding pumpback wells. Portage Environmental Inc. reviewed the current monitoring well program in 2004. It summarized the level of contamination in all wells in the report. The majority of wells below the pumpback system still show some cyanide, nitrate, or metal contamination. According to the SDEIS, "It is hard to define how much of that is from the 1983 leak or from the continued migration of seepage past the capture systems. The agencies and GSM continue to review sampling results and modify the seepage containment system to prevent violations at the permit boundary." **1993:** In August, a 7 gpm seep was discovered in a drainage area below the tailings impoundment. Cyanide levels in the seep were measured at 0.6 ppm (3 times human health standards). Another seep was found further down the drainage.[157] The water flowed down to a manmade catchment pond in the drainage, which was discharging into an overflow pipe down into an intermittent stream. **1993:** Cyanide solution from tailings impoundment leached into groundwater and surfaced as seeps which flowed into an intermittent drainage below. Cyanide concentrations ranging up to 45 ppm total cyanide (204 times human health standards).[158]
Tailings spills or failures.	**1983:** 19 million gallons of cyanide solution leaked from an unlined tailings impoundment. Cyanide solution leaked down through underground alluvial gravel channels, under a cut-off wall intended to prevent groundwater migration out of the impoundment. Resulting groundwater contamination affected the Jefferson River alluvium. Four domestic wells and a well at the veterinary clinic were contaminated. Placer Dome was sued by neighboring landowners. In 1989, six years after the spill, the groundwater was still contaminated with cyanide. The company eventually bought out the landowners.[159]
Impacts to water resources	The mine resulted in groundwater contamination to four domestic wells and a veterinary clinic. Water treatment in perpetuity will be required at this mine to prevent further impacts to water resources.

Ruby Hill Mine, NV The Ruby Hill Mine is an open pit gold mine located approximately 0.7 miles northwest of Eureka, NV on private land and BLM land. Mining operations were approved in 1997.	
Reports of pipeline failures and other accidental releases[160]	**August 7, 2015:** A storm event resulted loss of containment from the Barren Tank, North Side Heap Leach Pipe Channel, and the Pregnant Solution Tank and Pregnant Solution Pond. All solution contained cyanide and may have contained elevated levels of some metals. **August 16, 2004:** 1,900 gallons of process solution was released containing 1.2 lbs. of sodium cyanide as a result of a several hour rain event which overwhelmed lined leach pad beam. **June 19, 2003:** 2,400 gallons of process solution containing about 1.8 lbs. of cyanide was released from the Ruby Hill Leach Pad containment system when a barren solution pump failed.
Seepage collection and treatment failures	None identified.
Impacts to water resources	None identified. There are no perennial streams in the permit area and intermittent stream segments were removed or filled during construction of the East Archimedes Pit.[161]

Greens Creek Mine, AK Greens Creek, which started production in 1989, is an underground mine using flotation processes to recover zinc and lead and gravity processes to recover gold and silver. It is located in southeast Alaska in the Tongass National Forest on Admiralty Island, 18 miles southwest of Juneau.	
Reports of pipeline failures and other accidental releases	**2009:** On December 21, EPA issued a Notice of Violation (NOV) to Hecla Greens Creek Mining Company resulting from a June 8, 2009 inspection, which found the following violation: on August 11, 2009, Hecla Greens Creek Mining Company drillers observed an unpermitted discharge of mud entering Greens Creek. **2007:** On April 25, EPA issued a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company resulting from a July 7, 2006 inspection. The following violation was cited in the NOV: 1) the 2005 storm water monitoring report showed numerous discharges from storm water outfalls exceeding Water Quality Standards for lead and zinc.[162] **2007:** On 12/20/2007, a report of 450 gallons of diesel fuel from a broken hose connected to a barge, spilled into Hawk Inlet during fuel transfer.[163] **2007:** On 3/14/2007 a report of diesel fuel spilled into Hawk Inlet.[164] **2006:** On April 10, approximately 4,163 gallons of mine drainage discharged into Greens Creek due to a joint failure in a steel pipeline that normally transfers mine drainage from the mine to the Tailings Storage Facility Waste Water Treatment Plant. This event resulted in the Department of Environmental Compliance issuing a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company on April 28, 2006 for discharging water with lead and zinc concentrations exceeding Alaska Water Quality Standards (WQS).[165] **2004:** Greens Creek was fined $12,900 for two leaks the company reported, on June 28, 2004. The first water quality violation occurred when a bucket tipped over, spilling an estimated four gallons of diesel oil into upper Zinc Creek. Greens Creek personnel tracked the diesel sheen for ½ mile downstream.[166] Drilling mud was also released into Zinc Creek due to an overflow of a mine pond. **1989:** In May, the first attempt to load a barge with ore concentrate resulted in a major spill of approximately 95-100 pounds of lead sulfide and a total of approximately 1,000 pounds concentrate into Hawk Inlet.[167] In 1995, efforts to use a suction dredge to clean up the spill occurred, however a 2015 annual monitoring report states that concentrate is still present in the sediments.[168]
Seepage collection and treatment failures	The Draft Environmental Impact Statement (DEIS) for expanding the tailings storage facility documents impacts to surface and groundwater: The water quality in Further Creek, Further Seep, and Duck Blind Drain is generally of lower quality than that of Greens Creek, Tributary Creek, and Cannery Creek. In general, these drainages and seeps have elevated sulfate, lower pH, and elevated dissolved zinc as well as some other metals. The lower pH and elevated sulfate and metals in these drainage features were from other pyritic sources such as waste rock or production rock that were outside the slurry walls of the Tailings Disposal Facility.[169] Elevated metals levels in the North Fork of Further Creek were reported to be caused by a thin veneer of tailings residue at the toe of the West Buttress that accumulated from the removal of the temporary tailings cover in 1999, and from residual tailings found in the Northwest Diversion Ditch.[170]

	GREENS CREEK MINE, AK - CONTINUED According to the DEIS, in 2006, groundwater in several bedrock wells had elevated sulfate concentrations and conductivity. These wells are down-gradient and in close proximity to the Tailings Disposal Facility (TDF). Tailings contact water from the old unlined portion of the TDF likely seeped into the bedrock aquifer. This is also shown by the increasing sulfate concentration in Monitoring Well (2S). Monitoring Well 2S is located in an area where groundwater has an upward gradient and bedrock water may discharge to the shallow aquifers and surface water. Since then, the northwestern part of the tailings facility was excavated to install a liner, before re-depositing tailings. Sulfate concentrations increased in wells MW-T-04-14 and MW-T-05-04 in the most recent sampling event. It is possible that construction for the liner installation temporarily caused the increases."[171] Seepage from D Pond Berm contains some constituents above Alaska Department of Environmental Conservation Water Quality Standards and is discharging directly into Greens Creek.[172] According to the 2013 EIS, acid mine drainage from the mine will require water treatment for hundreds of years, if not in perpetuity.[173]
Impacts to water resources	Surface water in Further Creek, Further Seep and Duck Blind Drain has been degraded with sulfates, lower pH and zinc. Water quality violations for zinc and lead have occurred as a result of discharges into Greens Creek, and discharges of diesel oil and drilling mud to Zinc Creek. Adverse impacts to sediments in Hawk Inlet from a spill of ore concentrate. Groundwater has been degraded with sulfates.

WHARF MINE, SD Wharf is an open pit cyanide heap leach mine in the northern Black Hills of South Dakota. It has been operating since 1982. The mine is located on private lands and public lands managed by the Bureau of Land Management.	
Reports of pipeline failures and other accidental releases	**2014:** Approximately 5,000 gallons of blasting agent spilled.[174] **2001:** A release of process solution from a leak in the Pregnant Pond. Wharf also violated its surface water discharge permit for selenium.[175] According to the State, the violations stem from a series of water tests between July 2000 and June 2001 that showed selenium levels have been 5.79 to 8.59 parts per billion. To protect aquatic life, the standard for long-term exposure to selenium is 5 parts per billion. Wharf was fined $31,000 for violations. **2000:** Approximately 8,000 gallons of process solution containing cyanide spilled at Wharf mine when a pipe joint fell apart. The pipe is located in the leak detection system.[176] The EPA documented the following releases from 1984-1991[177] **1991:** Cyanide (1,317 gallons per day) **1991:** Cyanide (1,288 gallons per day) **1990:** Leachate 10,000 gallons **1988:** Cyanide (500 gallons) **1988:** Leachate (100 gallons) **1987:** Diesel fuel (4,000 gallons) **1986:** Process water (1 gallon/hour, amount unknown) **1984:** Cyanide (200 gallons)
Seepage collection and treatment failures	**2008:** Wharf violated its surface water discharge permit with the release of biomass from its water treatment plant during the summer of 2007.[178] The discharge affected fish populations in Annie Creek. Wharf also violated its permit limits for ammonia, cyanide, arsenic, and pH. Wharf was issued a civil penalty of $214,930.[179] **2008:** Coincident with the in situ biotreatment of Process Area ground water, concentrations of arsenic in Process Area ground water dramatically increased.[180] Background arsenic concentrations associated with the Pahasapa limestone aquifer underlying the Process Area are very low to negligible. Prior to 2008, most process area wells only rarely yielded water with detectible concentrations of arsenic. In 2008, arsenic levels in Monitoring Well-44, Monitoring Well-47, HDH-11 and HDH-12 all increased to well above the 0.01 mg/l ground water standard. In general, as of 2011, arsenic levels in these wells appear to be stabilizing and/or decreasing. However, arsenic concentrations in MW-47, HDH-11 and HDH-12 still exceed the 0.01 mg/l standard. **2003:** Wharf violated its surface water discharge limits for ammonia and its groundwater discharge limits for nitrate down gradient of the spent ore pile.[181] **2000:** Surface water compliance point below Wharf's Reliance waste rock depository in the headwaters of Annie Creek exceeded daily maximum selenium during a period from August 1998 to July 1999.[182] Surface water monitoring below Wharf's spent ore depository in Ross Valley failed a Whole Effluent Toxicity test for the January to March 1999 quarter. Surface water compliance point 5 exceeded ammonia standards during November and December 1999. WHARF MINE, SD - CONTINUED

	WHARF MINE, SD - CONTINUED **1997:** Surface water compliance points below Wharf's Reliance waste rock depository in the headwaters of Rock Creek and below Wharf's spent ore depository in Ross Valley, and the instream sampling points in Annie Creek have exceeded the daily maximum total cyanide limit of 0.02 mg/l since March 1994.[183] From June 1995 to December 1997 groundwater sampling below Wharf's contingency pond in McKinley Gulch indicated nitrate concentration over groundwater standards directly attributable to the discharge of process solution. Monitoring well in the alluvium of Annie Creek approximately 450 feet upstream of its confluence with Spearfish Creek exceeded the 10 ppm groundwater for nitrate during 1996 and 1997. Also on a few occasions, Wharf exceeded selenium and copper at compliance point 1. These discharges caused numerous violations of law. **1995:** From August 21-28, Wharf discharged inadequately treated cyanide solution into Ross Valley and subsequently into Annie Creek. Approximately 300 fish were killed as a result of the discharge. The discharge caused several violations.[184] Wharf agreed to pay the department $150,000. Mining of the East and West Liberty Pits encountered sulfide rich rock. Department inspectors identified a number of small acid seeps in the Pit. Although mitigation occurred in 1999, the mine's 2011 discharge permit summary states that drainage from the West Liberty Pit area continues to impact the bedrock groundwater system in Nevada Gulch.[185] Sulfate levels in SMO1A are on an upward trend, with concentrations exceeding 1,900 mg/l. Pre-mining levels of sulfate were around 40 mg/l. The mine has also resulted in high concentrations of nitrates in groundwater, which is created from the breakdown of residual cyanide in the process area and spent ore impoundments and from blasting residues in fuel explosives found in the waste rock depositories. Since the mid-1990s, nitrate impacts have occurred in the groundwater underlying the process ponds and leach pads. Since 1995, nitrate levels have repeatedly exceeded nitrate water quality standards to protect public health.[186] Wharf identified leakage sources in the leach pad dams, process ponds, and leak detection galleries.
Impacts to water resources	Groundwater has been polluted with nitrates, arsenic and cyanide at levels above water quality standards. Annie Creek has been polluted with selenium, ammonia, cyanide, and arsenic above water quality standards. Adverse impacts to surface water in Annie Creek resulted in a fish kill; adverse impacts to fish population.

ROBINSON MINE, NV The Robinson Mine is an open pit gold and copper mine located in eastern Nevada approximately 11 km west of the town of Ely. It is located on private lands and BLM lands. It was formerly owned by BHP Copper, Magma Nevada Mining Company.	
Reports of pipeline failures and other accidental releases[187]	**November 30, 2016:** 5,490 gallons of tailings slurry was released from a failed pipeline. **May 30, 2016:** About 2,800 gallons of tailings solution was released from a leaking embankment. **January 23, 2015:** 5,200 gallons of process solution was released from a failed startup valve. **September 3, 2013:** An estimated 420,000 gallons of water and 2,500 tons of tailings solids was released from the Downstream Stormwater and Sediments Control Facility as a result of a significant storm. **July 13, 2013:** Approximately 20,000 gallons of process solution was spilled when a collection box became overwhelmed. **May 13, 2004:** Approximately 4,800 gallons of process solution was spilled when a weld on a pipeline failed. **May 5, 2004:** About 180,000 gallons of tailings slurry was released when a pipeline broke. **1996:** The mine experienced eight reported spills during 1996. Most of these spills involved tailings solution and reclaim water releases due to equipment failures. The five spills resulting in releases of copper flotation tailings had spill volumes ranging from 1,500 gallons to 66,000 gallons. Four of these spills resulted in contamination of relatively small areas of soil. The largest spill resulted in contamination of a downstream drainage bed for 2.3 miles with an average flow path width of 3 ft. Two spills resulted in a combined release of 76,000 gallons of reclaim water.[188] In August of 1996, the NDEP notified BHP Copper that it was in violation of its Water Pollution Control Permit due to increased levels of Total Dissolve Solids and pH. A consent agreement was developed in 1997 for the accidental release of tailings from the tailings storage facility on February 24, 1996.
Seepage collection and treatment failures	**2016:** The Final Environmental Assessment for expansion of the mine documents the continued degradation of groundwater from sulfates, which has occurred as a result of seepage from the tailings pond.[189] According to the EA, "The existing TSF was permitted without a liner. Groundwater fate and transport modeling completed to support the original permit considered the transport of sulfate from the facility, but not at the concentrations that now exist in groundwater downgradient from the facility. The seepage from the unlined impoundment has impacted downgradient groundwater causing exceedance of maximum contaminant levels (MCLs) of sulfate in several monitoring wells (Figure 2-3)." **2015:** In early 2015, groundwater degradation with respect to sulfate was discovered in groundwater monitoring well WCC-G7 – south of the tailings embankment.[190] The detected sulfate concentration of 711 mg/l exceeds the 500 mg/l reference value for sulfate. On April 29, 2015, the Division issued a Finding of Alleged Violation and Order, requiring the company to complete actions, which had already begun, to investigate and remediate the contamination – including groundwater wells to delineate the size of the contaminant plume.

CONTINUED **Seepage collection and treatment failures**	ROBINSON MINE, NV - CONTINUED **2010:** The State of Nevada issued a Finding of Alleged Violation and Order for the failure to comply with permit and regulatory requirements regarding stabilization of spent ore and associated acid rock drainage at the Intera and Green Springs area.[191] As required by the October 2010 Corrective Action Plan, the company was required to reconstruct the liner system of the Mill Water Ponds because leakage from the ponds was believed to be contributing to the Intera monitoring water flow. The Order required the mine to "submit a plan by May 11, 2010 stating whether the Mill-Water Ponds, the overhead standpipe near the Mille-Water Ponds, and any other leaking pipes or tanks in the area, would remain on the Liberty Dump or be moved off the Liberty Dump (and any other potential sources)." **1996:** A Consent Agreement and Order was developed in 1997 to resolve the Finding of Alleged Violation and Order issued August 20 1996 for alleged violations of discharge limits set by the Permit for the Giroux Wash Tailings Storage Facility.
Impacts to water resources	Groundwater degradation from sulfates, total dissolved solids, and manganese.[192] Contamination of downstream drainage bed for 2.3 miles from mine tailings process water (see spills above).

Florida Canyon Mine, NV The Florida Canyon Mine is an open pit cyanide leach gold mine on BLM land and private land approximately 7 miles southwest of Imlay, Nevada. It has been in operation since 1986.	
Reports of pipeline failures and other accidental releases[193]	July 7, 2016: Unknown quantity spill occurred from a leach pad (washout), but with no cyanide content. **February 21, 2011:** 100,000 gallons of pregnant solution (cyanide) was released due to a blockage of the solution ditch by ore that slid off the angle of repose slopes. The solution was high in chloride, arsenic, nitrate, mercury, sulfate, and total dissolved solids. **January 8, 2008:** 7,892.7 gallons of cyanide process solution spilled releasing 0.17 lbs. of cyanide. The spill results from an overflow in the solution collection channel from the accumulation of debris in the channel. **May 17, 2005:** Stormwater released from sedimentation pond overflow at a rate of 200 gallons per minute. There were no process contaminants suspected in the release. **December 30, 1996:** 52,500 gallons of cyanide solution (concentration less than 90 mg/L but greater than 22 mg/L) was released with a cyanide content estimated at 20.9 lbs. caused by a foreign object in a chemical pipe. **January 7, 1994:** 79,260 gallons of 65 mg/L cyanide solution flowed out of containment from a ruptured pipe releasing 22.76 lbs. of cyanide. **April 13, 1993:** 400 gallons of cyanide solution containing less than 0.002 lbs. of cyanide spilled as a result of a frozen pump. **June 4, 1991:** 112 gallons of cyanide solution was spilled from a split in a line releasing 0.10 lbs. of cyanide. **April 8, 1991:** 535 gallons of cyanide solution sprayed on an access road due to a split in the line, and about 0.47 lbs. of cyanide was released. **March 12, 1991:** 1,200 gallons of cyanide solution was released due a failure from a pipe from the barren pond to the heap leach pad. The total amount of cyanide released was about 1 lb.[194] **September 4, 1990:** 30 gallons of cyanide solution containing 0.042 lbs of cyanide leaked due to a crack in the mainline onto the leach pad perimeter road. **August 27, 1990:** Approximately 30 gallons of sodium cyanide solution containing 0.053 lbs. of cyanide was spilled due to a failure in a sump pump the process plant. **August 15, 1990:** 503 gallons of cyanide solution containing 0.61 lbs. of cyanide was released due to a pipeline rupture. **June 25, 1990:** 20 gallons and 240 gallons of cyanide containing 0.02 and 0.5 lbs. of cyanide respectively around one of the ponds. (Cause not stated) **June 22, 1990:** 52 gallons of cyanide solution containing 0.098 lbs. of cyanide leaked from a valve; 10 gallons of cyanide solution containing 0.002 lbs. of cyanide leaked due to operator error. **June 14, 1990:** 10 gallons of cyanide solution containing 0.04 lbs. of cyanide leaked due to a faulty valve. **May 16, 1990:** 13.735 gallons of cyanide solution containing 25.78 lbs. of cyanide was released when a d4 dozer torn a hole in the perimeter mainline. **May 8, 1990:** 45 gallons of cyanide solution containing 0.094 lbs. of cyanide from a valve failure as a result of a rusted bolt.

	FLORIDA CANYON MINE, NV - CONTINUED **May 2, 1990:** Approximately 2880 gallons (6 gpm for ~8 hours) of pregnant solution containing 8.28 lbs. of cyanide leaked due to a tear in the liner seam from high winds and an unanchored liner edge. **January 11, 1990:** 100 to 150 gallons of cyanide solution containing 0.33 pounds of cyanide was spilled due to operator error. **September 9, 1989:** 20 gallons of a lead nitrate solution was spilled when the barrel containing the solution was knocked over. There are no details on the amount of lead. **July 4, 1989:** 100 gallons of cyanide solution containing 0.2 lbs. of cyanide was spilled due to a break in a welded joint in a plastic pipe. **July 30, 1989:** Excessive dust from the crushing/conveying facilities was reported **November 27, 1987:** 200 to 300 gallons of cyanide solution was released. **October 2, 1987:** 6,000 gallons of barren solution sprayed off of the heap leach pad due to a cracked barren pipe. The amount of the release is unclear.
Seepage collection and treatment failures	**2000:** A contaminant plume comprised of process solution was discovered near the west side of the existing leach pad. Initially, the plume, consisting of weak acid dissociable (WAD) cyanide, mercury, and nitrates, was traced to leach pad solution channels. Routine monitoring in the second quarter of 2000 revealed elevated concentrations of process-related constituents in the vicinity of monitoring well MW-16. Continued monitoring of the area has shown that the process-related constituents have been detected in monitoring wells MW-16B, MW-F, MW-G, MW-KA, MW-M, MW-O, and MW-N.[195] In 2012, new monitoring wells confirm that groundwater in MW 28 is an area of detectable WAD cyanide and total nitrogen, with MW 29 and MW 31 within the plume.[196] **2000-2014:** Between 2000 and 2014, additional leaks were identified at various locations including the Barren Pond, solution channels, and sumps. As a result of continued contamination of groundwater NDEP issued a Finding of Alleged Violation and Order in August 2012. BLM placed the mine in Noncompliance in August 2012.[197]
Impacts to water resources	Groundwater has been polluted with cyanide, mercury and nitrates at levels that exceed drinking water standards.[198]

Mineral Ridge, NV The Mineral Ridge Project (Mineral Ridge) is an active open pit and inactive underground mine located approximately 4.5 miles northwest (by air) of the town of Silver Peak, Nevada. The project is located on both private land and public land administered by the BLM.	
Reports of pipeline failures and other accidental releases[199]	**May 11, 2011.** A cyanide waste of unknown quantity was released as an improper disposal in a landfill. The practice had been occurring for the past several months.February 26, 2005. About 100 gallons of pregnant solution was spilled when a heap well failed at a joint. **March 3, 2004**. 2,355 gallons of cyanide leach solution containing 1.57 lbs. of cyanide was released from heavy snow melt on a leach pad.
Seepage collection and treatment failures	None documented.
Impacts to water resources	None documented. See above. No seeps, springs or perennial streams are located within the mine permitted area.[200] Off-site springs are monitored only once a year. Groundwater >500 feet bgl.

Briggs Mine, CA The Briggs Mine is an open pit heap leach gold and silver mine located about seven miles north of Ballarat, CA in the Panamint Valley near Death Valley National Park on public lands managed by the BLM and private lands.	
Reports of pipeline spills and other accidental releases	**2009:** A Notice of Violation was issued for process solution discharged to the ground outside the containment of the lined leach pad area on two separate occasions n 2009. The process solution contained 120 parts per million cyanide. On December 14, 2009 approximately 50 gallons of process solution was released. On December 31, 2009 a second released occurred in which 400 gallons of process solution was discharged.[201]
Seepage collection and treatment failures	**2017**: Ground water monitoring wells continue to show elevated cyanide levels.[202] **2015:** A Notice of Violation was issued for cyanide detected in a monitoring well at levels that violate compliance action levels.[203] The initial detection of WAD cyanide in MW-6 was confirmed in subsequent sampling events at a concentration of 0.064 milligrams per liter (mg/L) on October 28, 2015 and 0.066 mg/L on December 10, 2015. The detected concentrations of WAD cyanide exceed the Water Quality Protection Standard (WQPS) concentration limit of 0.03 mg/L and constitutes verification of measurably significant evidence of a release and establishes the requirement for an EMP as required under Title 27 of the California Code of Regulations (CCR) §20420(k)(5).[204] An engineering report in 2016 determined that the cyanide in groundwater is due to leaks in the barren solution line located north and east of the solution ponds at the Site.[205]
Impacts to water resources	Groundwater contamination from cyanide.

Rochester Mine, NV The Rochester Mine has been in operation since 1986. It mines gold and silver from open pit mining and heap leach processing operations, and it is located on private land and BLM land.	
Reports of pipeline spills and other accidental releases[206]	**2013:** Report of 5,447 pounds of cyanide released onto ground.[207] **March 19, 2012:** 123.5 tons of heap leach material slide off the pad and out of containment. As a result, a calculated 4,203 gallons of solution containing 24.5 lbs. of material containing cyanide was released from a heap leach pad due to a break in a broken 8 inch solution feed line.[208] **November 23, 2007:** About 700 gallons of solution containing 3.2 lbs. of cyanide was spilled due to a frozen pipeline. **November 11, 2013:** Saturated leach pad material overwhelmed the containing berm, which was calculated to contain 6,288 gallons of solution and 47.2 lbs. of sodium cyanide. **May 6, 2013:** 1105.08 gallons of barren solution containing 6.91 lbs. of cyanide was released due to operator error. **May 23, 2007:** An estimated 3,792 gallons of pregnant solution containing cyanide, elevated levels of arsenic, mercury, silver, and nickel were released from a pipeline failure. **2007:** A report of a leak in a solutions line released 20 pounds of cyanide.[209] **1997:** A report of a broken pipe from the heap leach pad released 40 pounds of cyanide.[210] Also a report of a process line failure released 7.9 pounds of cyanide.[211] **1996:** The second spill occurred on March 6, 1996. Freezing overnight temperatures caused a line in the leach pad to rupture. Consequently, 5,500 gallons of sodium cyanide process solution escaped the heap leach pads primary containment system. 4,500 gallons of the process solution mixed with 35,000 gallons of fresh water from snowmelt. The remaining solution mixed with an unknown amount of snowmelt.[212] **1994:** Two spills have been reported at the mine facility since 1994. The first reported spill occurred on February 18, 1994. As a result of a power outage, 450 tons of ore containing process solution was displaced from the leach pad. From 1.97 to 9.861 lbs. of cyanide were washed out with the ore. **1988:** A broken pipeline resulted in the displacement of 200 tons of ore off the liner, causing 19,400 gallons of process solution containing 45.3 lbs. of cyanide to be released to the environment. Of this, ,5000 gallons of process solution containing 11.7 lbs. of cyanide were discharged off site to American Canyon, an intermittent drainage. A dike was installed in American Canyon to stop solution flows.[213] **1987:** A release of process solution from the East Pregnant Pond occurred, causing pregnant solution to run into American Canyon for 12-18 hours at a rate of 5-10 gpm. The USEPA issued a Notice of Violation on June 30, 1988 for violating the Clean Water Act by discharging pregnant to American Canyon.[214]

Water collection and treatment failures	ROCHESTER MINE, NV - CONTINUED Releases from the Stage I heap leach pad have contaminated groundwater. Leakage from the pad was first noticed in 1991, near the north side (HydroGeo, 2010). Concentrations of arsenic, mercury, manganese, nitrate/nitrite, TDS, and WAD CN were measured; they were found to be above the Nevada reference values in WI-16, WI-17R, WI-19, WI-29/R, MW-30/R, MW-35, MW-37, and MW54 (SWS 2014). Well TB-1, downgradient of the stage 1 pad, exceeds Nevada Profile I reference values. The maximum detected concentration at TB- 1 between March 2011 and May 2013 was 650 mg/L CN-, 0.075 mg/L arsenic, 3.8 mg/L mercury, and 2,300 mg/L TDS (SWS 2014).[215] In 2003, the Nevada Department of Environmental Protection issued Rochester a Finding of Alleged Violation (FOAV) for cyanide exceedences discovered during quarterly monitoring. The violation was issued in response to the discovery of cyanide exceedences in MW-16, a monitoring well screened in the shallow bedrock below the site. Contamination had been previously confined to the alluvium.[216] Groundwater monitoring wells downgradient of the Stage I heap leach pad showed exceedences of arsenic, mercury, cadmium, nitrate and WAD cyanide during the period 2000 to 2003. Surface water monitoring sites in a spring downgradient of the Stage I heap leach pad showed exceedances of nitrate, lead, cyanide, arsenic, mercury.[217]
Impacts to water resources	Groundwater polluted with arsenic, mercury, manganese, nitrate/nitrite, TDS and cyanide. American Canyon (an intermittent drainage) has been contaminated by a process solution spill in 1988. Exceedances of arsenic and nitrate in American Canyon springs.

Denton Rawhide Mine, NV The Denton-Rawhide Mine is located approximately 36 miles southeast of the town of Fallon, NV. The mine is located on private land and public land administered by the U.S. Bureau of Land Management (BLM). The project consists of an open pit gold and silver mine.	
Reports of pipeline failures and other accidental releases[218]	**January 18, 2015**: 6,000 gallons of cyanide solution released due to a weld failure in a HDEP pipe, and the total release was about 6.25 lbs. **January 3, 2012:** 20 to 30 gallons of 0.015 mg/L mercury solution released due to an elevated flow volume in a carbon vessel. **November 24, 2011:** Water flooded the mercury retort's outside filter and flowed out of containment. The contaminated water exceeded standards for arsenic (0.27 mg/L), mercury (0.015 mg/L), sulfate (2,600 mg/L), and total dissolved solids (3,700 mg/L). **December 13, 2008:** Approximately 3,000 gallons of process solution released do to a pipe failure form excessive corrosion and cold temperatures resulting in section pulling apart. The total release of sodium cyanide was about 0.25 pounds. **2002:** Rawhide experienced three process solution spills off the heap leach pad, the largest consisting of 40,000 gallons (47 pounds of cyanide) occurred as a result of ruptured pipe. The remaining two were 6,000 gallons (8 pounds of cyanide) and 1,000 gallons (1.5 pounds of cyanide), respectively.[219] **November 1, 2001:** 1800 gallons of cyanide solution released for a total of 2.25 lbs. of cyanide discharged. The cause of the release was a bulldozer running over a barren solution return line. **October 15, 2001:** 25,000 gallons of cyanide solution spilled for a total of 0.2 lbs. released as a result of a HDPE pipe weld splitting. **September 8, 1999:** Two cyanide spills occurred at 4,700 and 3,000 gallons of cyanide solutions at concentrations of 0.1 lbs./ton and 0.05 lbs./ton respectively due to a broken pipeline. **1990:** Safety pond solution (167 gallons per day). Unknown total amount.[220]
Water collection and treatment failures	None documented.
Impacts to water resources	Groundwater in the vicinity of the facility was not located. More than 300 exploratory holes were drilled to depths of at least 500 feet, with several drilled to 2000 feet depth. None of the holes drilled encountered groundwater. No surface water is within 5 miles of the project except for ephemeral washes that drain into the alkali flat of northwest Gabbs Valley.

References

1 EPA, Toxic Release Inventory, 2015. Gold mines in the report released an estimated 525 million pounds of toxic releases in 2015 - approximately 42% of all hardrock mining releases – the industry sector that is the leading source of hazardous releases in the U.S.

2 USGS, 2013 Minerals Yearbook, Gold (Advance Release), October 2015.

3 This failure mode includes pipeline breaks that release mine tailings, cyanide solution, or other contaminants. It also includes other accidental releases, such as partial or full tailings dam failures, overtopping of process ponds, and transportation spills.

4 This failure mode includes seepage of mine impacted waters (e.g., acid mine drainage, cyanide solution, metal-laden waters) from tailings ponds, waste rock piles, heap leach pads or other facilities into groundwater water or surface water. It also includes discharges from mine treatment facilities that exceed regulatory requirements.

5 Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.

6 Only navigable waters are subject to the Clean Water Act. Ephemeral streams that do not meet the definition of navigable are not subject to the Clean Water Act.

7 U.S. Department of Interior, Bureau of Land Management, Environmental Assessment Mineral Ridge Mine Mary LC and Satellite Deposits, April 2015. p. 25.

8 Id.

9 http://www.epa.gov/region8/superfund/ut/kennecottsouth/index.html

10 Id.

11 http://www.cyanidecode.org/sites/default/files/pdf/NewmontCarlinAudSum_0.pdf

12 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Gold Quarry James Creek Spill Reports. Unless otherwise noted.

13 NDEP, NPDES Fact Sheet (Draft), Mill 5/6 Gold Quarry – James Creek Project, Renewal 2012, Fact Sheet Revision 03)

14 National Response Center Incident Report No. 869389, April 29, 2008.

15 National Response Center Incident Report No. 551640, December 21, 2000.

16 Las Vegas Sun, "Mining company may face penalty for cyanide spill," June 16, 1997.

17 National Response Center Incident Report No. 193036, August 17, 1993.

18 National Response Center Incident Report No. 22254, April 16, 1990.

19 NDEP, NPDES Permit Draft Fact Sheet, Mill 5/6 Gold Quarry-James Creek Project, Renewal 2012.

20 Id.

21 NDEP, Spill Report, Number 140603-01, June 3 2014

22 NDEP, Spill Report, Number 140211-01, Feb 10, 2014; Newmont report to NDEP, Feb 19, 2014.

23 NDEP, Spill Report, Number 131224-02, Dec 12, 2013; Newmont report to NDEP, Dec 31, 2013.

24 NDEP, Factsheet for the Fortitude/Reona (Phoenix) Project, Permit Number NEV0087061 (2006 Renewal, Revised for 2010 Maj. Mod.)

25 Id.

26 NDEP, Factsheet for the Fortitude/Reona (Phoenix) Project, Permit number NEV0087061 (Renewal 2006).

27 U.S. BLM, Final Environmental Impact Statement Phoenix Project, January 2002, p. 3.2-33

28 U.S. BLM, Final Environmental Impact Statement Phoenix Project, January 2002, pp. 3.2-33 – 3.2-34.

29 U.S. BLM, Final Environmental Impact Statement Phoenix Project, January 2002, p. 3.2-18.

30 U.S. BLM, Final Environmental Impact Statement Phoenix Project, January 2002, p. 3.2-38.

31 NDEP, Factsheet for the Fortitude/Reona (Phoenix) Project, Permit number NEV0087061 (Renewal 2006).

32 Brown and Caldwell, Iron Canyon Data Summary Report, Battle Mountain complex, Lander County, Nevada. Carson city, Nevada.

33 NDEP, Fourth Quarter 2015 Monitoring Report Phoenix Project, Permit Number NEV00877061.

34 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Twin Creeks Spill Reports. Unless otherwise noted.

35 National Response Center Incident Report No. 603603.

36 Elko Daily Free Press, Newmont Monitoring Cyanide Spill, May 15, 2002.

37 National Response Center Incident Report No. 569584.

38 National Response Center Incident Report No. 566436.

39 Reno News, "Cyanide Flush" July 5, 2001.

40 Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.

41 Id.

42 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Cortez Joint Venture Spill Reports. Unless otherwise noted.

43 U.S. EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997.

44 Id.

45 https://ndep.nv.gov/docs_16/NEV0000023_fsFY16.pdf

46 https://ndep.nv.gov/docs_16/NEV0000023_fsFY16.pdf

47 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Barrick Goldstrike North Block Spill Reports. Unless otherwise noted.

48 Id.

49 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Barrick Goldstrike North Block Spill Report – NDEP number 120605-02.

50 U.S. BLM, Draft Supplemental Environmental Impact Statement, August 2008, p. 3.3-62.

51 U.S. BLM, Draft Supplemental Environmental Impact Statement Betze Pit Expansion Project, August 2008, p. 3.3-13.

52 https://dec.alaska.gov/spar/ppr/response/sum_fy13/120823301/120823301_index.htm

53 https://dec.alaska.gov/spar/ppr/response/sum_fy10/100504301/100504301_index.htm

54 SRK consulting, Environmental Compliance and Management Audit: Fort Knox and True North Mines, May 2012.

55 Alaska Dispatch News, "Pogo Mine reports 90,000-gallon spill of cement-like backfill," May 8, 2015.

56 http://dnr.alaska.gov/mlw/mining/largemine/pogo/pogo2012/pogo2012ppt.pdf

57 http://dnr.alaska.gov/mlw/mining/largemine/pogo/pdf/pogo2013ppt.pdf

58 http://dnr.alaska.gov/mlw/mining/largemine/pogo/pdf/pogo2012ar.pdf

59 http://dnr.alaska.gov/mlw/mining/largemine/pogo/pdf/pogo2013ppt.pdf

60 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Smokey Valley/Round Mountain Spill Reports. Unless otherwise noted.

61 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Barrick Goldstrike North Block Spill Report – NDEP number 120605-02.

62 U.S. BLM, Draft Supplemental Environmental Impact Statement, August 2008, p. 3.3-62.

63 U.S. EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997.

64 Geoengineers Inc., Summary Audit Report, International Cyanide Management Code Recertification Audit, August 2010.

65 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Turquoise Ridge/Getchell Mine Spill Reports. Unless otherwise noted.

66 National Response Center, Incident Report No. 987867

67 National Response Center, Incident Report No. 990280

68 National Response Center, Incident Report No. 985090

69 National Response Center, Incident Report No. 929521

70 National Response Center, Incident Report No. 853889

71 National Response Center, Incident Report No. 823579

72 National Response Center, Incident Report No. 820928

73 National Response Center, Incident Report No. 812340

74 National Response Center, Incident Report No. 792304

75 National Response Center, Incident Report No. 738803

76 National Response Center, Incident Report No. 711893

77 National Response Center, Incident Report No. 706853

78 National Response Center, Incident Report No. 653465

79 National Response Center, Incident Report No. 646582

80 National Response Center, Incident Report No. 646700

81 National Response Center, Incident Report No. 646508

82 National Response Center, Incident Report No. 604649

83 National Response Center, Incident Report No. 561032

84 National Response Center, Incident Report No. 530556

85 National Response Center, Incident Report No. 537295

86 U.S. EPA, Kennecott North, ROD, 2002. p. 129 of pdf.

87 Id.

88 U.S. EPA, Kennecott North ROD, 2002, p. 205 of pdf.

89 U.S. EPA, ECHO.gov, Kennecott copper smelter & refinery, CWA/NPDES compliance status, Apr-June 2011 & Jul-Sept. 2011.

90 http://www.epa.gov/region8/superfund/ut/kennecottsouth/index.html

91 U.S. EPA, Kennecott North ROD, September 2002.

92 Richard Borden, et. al. "Groundwater response to the end of forty years of copper heap leach operations, Bingham Canyon Utah." Paper presented at the 7th International Conference on Acid Rock Drainage, March 26-30, 2006. Published by the American Society of Mining and Reclamation, 3134 Montavesta Road, Lexington, KY 40502. p. 231.

93 United States v. Kennecott Utah Copper Corporation. Complaint Case: 2:08cv00122. February 14, 2008. www.fws.gov/.../r_r_Kennecott_Utah_Copper_ComplaintFinal.pdf

94 Id.

95 https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0800601&msspp=med

96 http://www.epa.gov/region8/superfund/ut/kennecottsouth/index.html

97 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Hycroft Spill Reports. Unless otherwise noted.

98 U.S. EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997.

99 NDEP, Fact Sheet for Crofoot Heap Leach Facility, Permit Number NEV0060013 (Renewal 2017, Fact Sheet Revision 00).

100 NDEP, Fact Sheet, Hycroft Resources and Development, 07-2012.

101 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Marigold Spill Reports. Unless otherwise noted.

102 Id.

103 U.S. BLM, Marigold Mine Expansion Project: Draft Environmental Impact Statement, January 2000, p. 3-23

104 Spokesman Review, "Wastewater Spills into Creek." May 4, 2012.

105 Stratus Consulting, Analysis of Water quality impacts at the Buckhorn Mountain Mine and Recommendations for Improvement," November 4, 2010.

106 Stratus Consulting, Analysis of Water quality impacts at the Buckhorn Mountain Mine and Recommendations for Improvement," November 4, 2010.

107 Spokesman Review, "Buckhorn Mine owner fined for water quality violations," July 2012.

108 Wenatchee World, "Water quality requirements at Buckhorn Mine upheld," August 5, 2016.

109 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Jerritt Canyon Spill Reports. Unless otherwise noted

110 Stratus Consulting, Analysis of Water quality impacts at the Buckhorn Mountain Mine and Recommendations for Improvement," November 4, 2010.

111 Washington Department of Ecology, Buckhorn Gold mine fined $40,000 for violating water quality permit, April 28, 2009.

112 Stratus Consulting, Analysis of Water quality impacts at the Buckhorn Mountain Mine and Recommendations for Improvement," November 4, 2010.

113 Id.

114 Id.

115 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Jerritt Canyon Spill Reports. Unless otherwise noted.

116 NDEP, Fact Sheet for Jerritt Canyon Mine, Permit Number NEV0000020 (Renewal 2015, Fact Sheet Revision 00).

117 Id.

118 National Response Center Report #550270

119 Ibid.

120 EPA 1997.

121 EPA Office of Compliance Sector Notebook Project: Profile of the Metal Mining Industry, September 1995.

122 Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.

123 NDEP, Fact Sheet for Jerritt Canyon Mine, Permit Number NEV0000020 (Renewal 2015, Fact Sheet Revision 00).

124 NDEP, Fact Sheet for Jerritt Canyon Mine, Permit Number NEV0000020 (Renewal 2015, Fact Sheet Revision 00).

125 Id.

126 Id.

127 Nevada Department of Environmental Protection, Bureau of Corrective Actions, letter to Queenstake Resources, Jerritt Canyon Mine, subject line "2008 first Half Semiannual Monitoring Report for the TCE Plume at the Jerritt Canyon Mine Project, Facility: ID Number F-001026," August 6, 2008.

128 Juneau Empire, "Drilling equipment accident results in fluid spill at Kensington Site. October 4 2005.

129 Id.

130 Alaska DNR, Inspection Report, Kensington mine, Available at: http://dnr.alaska.gov/mlw/mining/largemine/kensington/pdf/inspections/kens130530irUSDA.pdf

131 Alaska DNR, 2013 Inspection Report, Kensington Mine, Available at: http://dnr.alaska.gov/mlw/mining/largemine/kensington/pdf/inspections/kens20130625-130716irDNR.pdf

132 Alaska DNR, Inspection Report, Kensington Mine, Available at: http://dnr.alaska.gov/mlw/mining/largemine/kensington/pdf/inspections/kens130917irUSDA.pdf

133 Fairbank Daily News Miner, "Coeur Alaska fined $170,000 for Kensington Mine violation," May 5, 2017. http://www.newsminer.com/business/coeur-alaska-fined-for-kensington-mine-violation/article_1da52d4e-4f92-5a6c-90ba-bdfa70cfe7a6.html, Juneau Empire, "Acid Mine Drainage Found at Kensington Mine: State department issues a notice of violation to company for violating water quality standards," September 30, 2008. Available at: http://juneauempire.com/stories/093008/loc_338558528.shtml#.V-7IN5MrL2I

134 Id.

135 NewGold, Mesquite Mine spill report, February 9, 2017. Available at: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/1689857184/L10002722293.PDF

136 Id.

137 NewGold, Mesquite Mine spill report, August 26, 2015. Available at: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/7339514195/L10002722293.PDF

138 Id.

139 NewGold, Mesquite Mine spill report, August 26, 2015. Available At: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/7339514195/L10002722293.PDF

140 NewGold, Mesquite Mine spill report, April 7, 2015. Available at: http://geotracker.waterboards.ca.gov/regulators/deliverable_documents/6355624139/2014%20Annual%20Report%20WDO.pdf

141 U.S. EPA Office of Compliance Sector Notebook Project: Profile of the Metal Mining Industry, September 1995.

142 Id.

143 BLM, Mesquite Mine Expansion, Draft Environmental Impact Statement, August 8, 2000.

144 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Bald Mountain Spill Reports. Unless otherwise noted.

145 U.S. EPA, 1997.

146 NDEP, Bald Mountain Mine, Water Pollution Control Permit No. NEV0098100, NDEP Fact Sheet, July 2013.

147 Golden Sunlight Mine, Written Report on Lime Slaker Building Incident January 6, 2006-Operating Permit No. 00064. January 18, 2006.

148 Billings Gazette, "Gold Mine May be Fined," Nov. 7, 2000. Available at: http://billingsgazette.com/news/local/gold-mine-may-be-fined/article_4b70f8ba-2e26-54c7-a8e1-12e4fe556de7.html

149 Missoulian, "State looks into Cyanide Leak at Mine," October 16, 1998.

150 http://leg.mt.gov/bills/2011/Minutes/House/Exhibits/nah65a08.pdf

151 Id.

152 Id.

153 Id.

154 Kuipers, Jim, P.E., "Nothing New Here: A Technical Evaluation of Initiation 147" September 2004.

155 Montana Department of Transportation, letter to Barrick Gold Corporation, re: MDT Whitehall Maintenance Facility Water Supply Well, August 23, 2013.

156 Montana Department of Environmental Quality and U.S. BLM, Draft Supplemental EIS Golden Sunlight Mine Pit Reclamation, December 2004.

157 Id.

158 Kuipers, Jim, P.E., "Nothing New Here: A Technical Evaluation of Initiation 147," September 2004.

159 Id.

160 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Ruby Hill Spill Reports. Unless otherwise noted.

161 U.S. Department of Interior, Ruby Hill Mine Expansion-East Archimedes Project, July 2005.

162 Alaska Department of Environmental Conservation, Alaska Pollution Discharge Elimination System Permit Fact Sheet, Permit Number AK0043206, Permit Issuance Date September 30, 2011.

163 National Response Center Report No. 857748, December 20, 2007.

164 National Response Center Report No. 829164.

165 Alaska Department of Environmental Conservation, Alaska Pollution Discharge Elimination System Permit Fact Sheet, Permit Number AK0043206, Permit Issuance Date September 30, 2011.

166 Juneau Empire, "Two firms in Southeast Alaska pay sizable environmental fines," June, 13, 2006. http://juneauempire.com/stories/061306/sta_20060613050.shtml#.WB0CLOErJnY

167 http://dnr.alaska.gov/mlw/mining/largemine/greenscreek/pdf/gc2015hawk.pdf

168 http://dnr.alaska.gov/mlw/mining/largemine/greenscreek/pdf/gc2015hawk.pdf

169 U.S. Department of Agriculture, Greens Creek Mine Tailings Disposal Facility Expansion, Draft Environmental Impact Statement, April 2012.

170 Id.

171 Id.

172 SRK Consulting, Environmental Audit of the Greens Creek Mine, Final Report, March 2009.

173 Greens Creek Mine Tailings Disposal Facility Expansion Final EIS, Appendix C, at C-7. Available at: http://dnr.alaska.gov/mlw/mining/largemine/greenscreek/pdf/greens_creek-feis-vol-2-complete.pdf

174 Homefacts.com, ID#2014.110

175 Rapid City Journal, DENR investigating cyanide solution leak at Wharf Resources Mine, July 20, 2000.

176 Id.

177 U.S. EPA Office of Compliance Sector Notebook Project: Profile of the Metal Mining Industry, September 1995.

178 State of South Dakota, DENR, Amended Notice of Violation and Amended Order, In the Matter of Wharf Resources (USA), Inc. Violations of its Surface Water Discharge and Mining Permits, April 8, 2008

179 Id.

180 Id.

181 State of South Dakota, DENR, Notice of Violation and Amended Order, In the Matters of Wharf Resources (USA), Inc. Discharges into Surface and Ground Waters of the State, January 8, 2003.

182 South Dakota Department of Environmental and Natural Resources, Wharf Resources Violation History. State Exhibit 01.

183 Id.

184 South Dakota Department of Environment and Natural Resources, Violation History for Wharf Mine. 2008.

185 http://denr.sd.gov/des/mm/documents/WPASummaryDoc.pdf

186 http://denr.sd.gov/des/mm/documents/WPASummaryDoc.pdf

187 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Robinson Mine Spill Reports. Unless otherwise noted.

188 U.S. EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997, p. 170. The Robinson Mine was formerly owned by BHP Copper, Magma Nevada Mining Company.

189 U.S. Department of the Interior, Bureau of Land Management, Final Environmental Assessment, Robinson Mine Expansion Project, December 2016. p. 2-9

190 Nevada Department of Environmental Quality, Draft NPDES permit, Fact Sheet, Robinson Nevada Mining Company, Renewal 2016, Available at: https://ndep.nv.gov/docs_16/NEV0092105_fsFY16.pdf

191 Nevada Department of Environmental Quality, Finding of Alleged Violation and Order, Robinson Operation, White Pine County, Nevada, April 2010.

192 Nevada Department of Environmental Protection, letter to Robinson Mine (Pat Lorello, Environmental Manager) from SRK consulting, "CAP FPPC for Intera Drain and Juniper Seep – Technical Summary of Pertinent Issues," April 11, 2014.

193 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Florida Canyon Spill Reports. Unless otherwise noted.

194 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Florida Canyon Spill Reports; EPA Office of Compliance Sector Notebook Project: Profile of the Metal Mining Industry, September 1995.

195 Florida Canyon Mining Inc. NPDES Fact Sheet. WPC Permit NEV0086001, (Renewal 2011, Fact Sheet Revision 05).

196 Id.

197 U.S. Department of the Interior, Bureau of Land Management, Florida Canyon South Expansion Project, EA, November 2014.

198 Id. P. 47

199 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Mineral Ridge Spill Reports. Unless otherwise noted.

200 U.S. Department of Interior, BLM, EA Mineral Ridge Mine Mary LC and Satellite Deposits, April 2015.

201 Lahontan Regional Water Board, Notice of Violation, March 1, 2010. http://geotracker.waterboards.ca.gov/regulators/deliverable_documents/9280186295/NOV-CR%20BRIGGS%20PanamintValley3-1-10%28JZ%29.pdf

202 http://geotracker.waterboards.ca.gov/regulators/deliverable_documents/6983671426/Retest%20of%20MWs%2036%20Briggs%20Mine.pdf

203 Lahontan Regional Water Board, Notice of Violation of Waste Discharge requirements for the Briggs Project, September 2015.

204 Golder and Associates, Briggs Mine Evaluation Monitoring Program Report, February 22, 2016.

205 Golder & Associates, Engineering Feasibility Study for WAD Cyanide in Monitoring Well MW-6, May 27, 2016. http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/4161585211/L10003102272.PDF

206 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Rochester Mine Spill Reports. Unless otherwise noted.

207 National Response Center Incident Report No. 1054995.

208 National Response Center Incident Report No. 1006377; Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Rochester Mine Spill Reports.

209 National Response Center Incident Report No. 836412.

210 National Response Center Incident Report No. 373104.

211 National Response Center Incident Report No. 389320.

212 U.S. EPA, Damage Cases and Environmental Releases from Mines and Mineral Processing Sites, 1997.

213 Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.

214 Id.

215 U.S. Department of Interior, Coeur Rochester Mine Plan of Operations Amendment 10 and Closure Plan Final Environmental Impact Statement, February 2016.

216 Kuipers, J.R., Maest, A.S., MacHardy, K.A., and Lawson, G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines: The reliability of predictions in Environmental Impact Statements.

217 Id.

218 Nevada Department of Environmental Protection, Bureau of Mining Regulations and Reclamation, Denton Rawhide Spill Reports. Unless otherwise noted.

219 Denton Rawhide Mine, Power Point presentation, 2002.

220 U.S. EPA Office of Compliance Sector Notebook Project: Profile of the Metal Mining Industry, September 1995.

GREATERYELLOWSTONE.ORG
LOCATIONS IN MONTANA, IDAHO & WYOMING

HEADQUARTERS
215 South Wallace Avenue
Bozeman, Montana 59715
406.586.1593

August 2, 2017

The Honorable Lisa Murkowski
Chairman
Comm. on Energy & Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Comm. on Energy & Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

RE: Yellowstone Gateway Protection Act, S.941

Dear Chairman Murkowski and Ranking Member Cantwell:

Please accept this testimony into the official record for the July 26, 2017 hearing of the Committee on Energy and Natural Resources Subcommittee on Public Lands, Forests and Mining. The Subcommittee Chairman, the Honorable Senator Lee, stated the record would remain open for two weeks following the hearing.

Thank you Chairman Murkowski, Ranking Member Cantwell, Subcommittee Chairman Lee and Members of the Senate Committee on Energy and Natural Resources for holding this hearing and the opportunity to supply testimony on the Yellowstone Gateway Protection Act, S.941 on behalf of the Greater Yellowstone Coalition.

The Greater Yellowstone Coalition (GYC) is a regional conservation organization based in Bozeman, MT with offices in Idaho and Wyoming and over 90,000 members and supporters from across the country and within the Northern Rockies. Our mission is to work with people to protect the lands, waters, and wildlife of the Greater Yellowstone Ecosystem (GYE), now and for future generations. Our members include residents living in communities throughout Paradise Valley, including Gardiner and Livingston, and visitors enjoying the GYE, the Custer Gallatin National Forest, the Yellowstone River, Emigrant and Old Chico.

Support for S.941, the Yellowstone Gateway Protection Act

GYC, our members, supporters and partner organizations fully endorse the Yellowstone Gateway Protection Act S.941 in its current form. The bill currently under consideration by the Committee takes a very straightforward approach without overreach into additional lands nor with complications to unrelated issues or areas. Senate Bill 941 will remove approximately 30,370 acres of public land in two small mining districts of Park County Montana – the Emigrant Mining District and Crevasse (*sic*) Mining District – from future mineral entry under 1872 Mining Law. The language in the bill protecting Valid Existing Rights and other uses is consistent with legislative and judiciary precedent.

Public Processes to Date

The federal government currently interprets 1872 Mining Law as mandating mining as the highest and best use for public lands. But today's 21st Century society and economy is vastly different than it was even 30-35 years ago. Park County, Montana currently ranks in the top 6% among more than 2,000 non-metro counties nationally for creative class employment. In 2014 more than 3.5 million visitors to Yellowstone National Park spent more than $196 million in Park County including $70 million a year in direct spending from the fishing industry alone. Please refer to the attached summary economic report by Larry Swanson from the O'Connor Center for the Rocky Mountain West.

As an area with a thriving outdoor economy and reliance on natural amenities, Park County residents, businesses and visitors require certainty. Careful consideration to the private property rights of all must take place with an understanding of the current economic drivers and other uses of public lands. Park County has taken a good hard look at these potential mines and has come to the conclusion that proposing to explore or mine on the doorstep of America's crown jewel, Yellowstone National Park, does not provide the certainty the public demands.

No less than four state or federal public processes seeking public comment have been held since June 2015 along with dozens of public meetings and events. In that time, tens of thousands of substantive comments have been submitted with an overwhelming majority in opposition to gold mining in Paradise Valley or on the doorstep to Yellowstone. Every elected official and candidate in Park County including the County Commission has stated this is no place for a gold mine. This sentiment is also shared by all three of the MT delegation and Secretary of Interior Zinke. Please refer to the attached press clippings with references to the number of public processes and number of comments already submitted in opposition to gold mining on the edge of Yellowstone National Park.

Socio-Economic Impacts of Gold Mining in Park County

Socio-Economic data for Park County Montana is abundantly clear, between 1970 and 2000 Farm and Agricultural Services along with Service Related sectors have consistently made up more than 85% of the entire employment.[1] Mining, in all its forms, has rarely reached even one half of one percent and has consistently remained as the smallest sector (by several magnitude) of the local economy. During the decade ending in 1990, mining jumped up to 1.9% of the total employment for Park County (although still the smallest sector by far). This spike could be attributed to the Mineral Hill mine near Jardine and the New World explorations near Cooke City that were underway in the 1980s and early 1990s. Mineral Hill was shuttered in 1996, long before the predicted life-of-mine when it unexpectedly hit ground water that continues to flow out of the mine adit to this day. The plans for the New World mining district were universally recognized as one of the greatest threats Yellowstone National Park has ever faced (plus two additional major river systems, the Clarks Fork of the Yellowstone and the Stillwater River). After a long, very public and expensive effort, the New World district was permanently withdrawn from mineral entry.

As shown by these two recent examples, modern gold mining on the edge of Yellowstone National Park does not provide the employment sustainability nor the

---

[1] A profile of Socioeconomic Measures, Park County MT. Produced by Economic Profile System. Headwaters Economics. http://headwaterseconomics.org/eps

environmental certainty demanded by the residents, visitors and businesses found in Park County and the gateway communities to Yellowstone National Park.

A recent Outdoor Industry Association report[2] indicates Montana's outdoor economy outpaces almost every other economic sector except real estate and government, generating 71,000 direct jobs and $7.1 billion annually to the state's economy. The real estate and outdoor economies rely on the pristine waters, wildlife habitat and unfettered scenery found on our public and private lands throughout Montana. There is no place in Montana where this is more evident than Paradise Valley and the gateway to Yellowstone National Park.

Make no mistake, mining is part of Montana's heritage. Known as the "Treasure State," Montana's state motto "*Oro y Plata*" is permanently etched with this reminder. Yet it is time for the remnants of the Emigrant and Crevice Mining Districts to be left to this history and researchers and as a reminder that the "highest and best use" of our public lands has changed over time and that healthy economies in some areas like the gateway to Yellowstone are driven by other factors.

Examples of a healthy economy in the gateway to Yellowstone

In Emigrant Gulch, exploratory drilling last occurred 25 years ago. This drilling was unsuccessful and those companies have all gone bankrupt. In 1992, Bryan & Sally Wells, whose families have lived in the gulch since the 1800s, had yet built their Emigrant Creek Cabins (www.emigrantcreekcabin.com). Having lived through the entire spectrum of gold mining in Emigrant, three generations of Wells currently embrace this mining history with an entrepreneurial spirit and understanding that it is Yellowstone that is the true driver of the local economy and allowed for their family to stay and thrive in their home. Today, the access road into Emigrant Gulch literally runs within a few feet of these homes and businesses.

In 1992, long-time general manager Colin Davis had not yet purchased Chico Hot Springs Resort (www.chicohotsprings.com) which he did in 2015. Mr. Davis has committed to maintain Chico as a family-owned and operated local institution including opening over 360 acres of private land for public recreation at the mouth of Emigrant Gulch. This commitment, made without the specter of a massive mining operation in his back yard and at his front door, was made to ensure that the resort can maintain its heartbeat of Paradise Valley and continue to employ hundreds of people as it has since 1900.

Printing for Less (www.printingforless.com), the nation's first e-commerce commercial printer and today one of Park County's largest employers was just a business plan by founder Andrew Field that was built around a location where employees can fish, hunt, float and enjoy unspoiled public lands.

Arthur Blank had yet purchased Mountain Sky Guest Ranch (www.mountainsky.com), which now stewards thousands of acres of agricultural land and livestock, provides in-stream flows to the most important cutthroat trout tributary on the entire Yellowstone River, engages our youth in multiple programs, and builds a stronger community through the Arthur Blank Foundation and donations to other local organizations.

---

[2] https://outdoorindustry.org/state/montana/

Businesses such as Hells-A-Roarin Outfitters (www.hellsaroarinoutfitters.com), owned and operated by generations of the Johnson family, were in the earliest stages of becoming what is now the largest outfitting business on public land in America. As their father did for over 80 years before, the Johnson family continues to rely on Crevice Mtn for their water, hunting access, wildlife habitat and now their year-round home. This uniquely-Montana success story would not have been possible with a mountain-top mine operation (such as those currently proposed) that fragments the critical migration corridor as well as their way of life and business.

The Sage Lodge, a recent multi-million dollar investment by the Joshua Green Corp www.joshuagreencorp.com) into a year round hunting, fishing and resort lodge combined with extensive private land and river conservation would not have been possible in 1992 and today would not be a sustainable business for the long-term if next to a large-scale industrial mining operation and the associated ground and air traffic.

Spectech Sensors (www.spectecsensors.com) founders Walter & Regina Wunsch relocated to Emigrant in 1989 for the beauty, peace, recreation and proximity to Yellowstone National Park. These remain the key ingredients which allow this innovative company to draw talent but also to provide tech job opportunities for locals as they produce advanced industrial products in an exemplary low impact setting fit for this environment now and into the future.

For every one of the examples of larger employers, there are dozens of smaller mom-and-pop and individual entrepreneurs counting on clean air, clean water, unfettered access to public lands and streams, unencumbered local roads and services, abundant wildlife, and the privilege to attract quality employees and to service the visitors that drive this healthy economy. These few examples prove the relatively short-term prospects of gold mining on the edge of Yellowstone National Park and Paradise Valley does not provide the generational certainty for private property rights, self-determination and a way of life these families and businesses demand.

In response to these concerns, every one of the businesses highlighted above are among the 350+ members of the Yellowstone Gateway Business Coalition (www.dontmineyellowstone.com) which has just one mission, to permanently protect the Emigrant and Crevice mining districts from industrial scale gold mining.

Impacts of Gold Mining

Recent research (July 2017) of 27 gold mines across the US has determined that 100% of the mine operations have experienced at least one failure, with most mines experiencing multiple failures.[3] Water quality impacts to surface and or groundwater were identified at 74% of the mining operations. Of the mines where water quality impacts were not identified, all are located in the arid southwest where precipitation is low and at 6 of the 7 mines, no perennial streams are present. This is certainly not the case for the gateway to Yellowstone where meteoric precipitation, groundwater, and perennial springs are abundant.

---

[3] Earthworks, July 2017. US Gold Mines: Water Quality Report – The Track Record of Environmental Impacts Resulting from Pipeline Spills, Accidental Releases and Failure to Capture and Treat Mine Impacted Water. Report at: http://earthworksaction.org/USgoldminefailures

GYC has previously submitted to this Committee four reports that paint a clear picture how "modern mining" and the long-term threats posed by sulfide-ore bodies does not instill the confidence in a healthy future demanded by the residents, visitors and businesses in Park County and the gateway communities to Yellowstone.

Water Quality

Tailings from the Mineral Hill mine in Jardine continue to require mitigation despite award-winning reclamation work done in the early 2000s. Every hydrologic prediction during the permitting processes that stated there would be no impacts were not accurate. To this day, those mine workings with potential for excess levels of arsenic continue to flow into Bear Creek, then a short distance directly into Yellowstone National Park and ultimately, the Yellowstone River.

Upper portions of Emigrant Creek contain natural acid drainage as identified by the presence of ferricrete, natural-pH levels, and suspended minerals at various sampling sites. Yet this unique system of alpine basins, springs and ice caves naturally recovers as Emigrant Creek nears the mouth of the Gulch near Chico Hot Springs through additional clean water in-flows that adjust the pH and quality.

It is probable that increased exposure of geologic materials via exposed drill cuttings, land disturbance and other exploration activities, including vehicle activity in streams, may increase the amount of acid drainage and impair the ability of the watershed to maintain water quality standards currently existing in Emigrant Gulch. It is certain that large-scale lode mining of any sort ("block and cave" or open pit) will overwhelm the creeks ability to provide the abundant clean water that feeds the local aquifer, irrigation, drinking water, fish habitat and the entire way of life of Paradise Valley.

It can be proven throughout this region that mining will encounter significant interactions with water. The passage of S.941 will help protect this life-blood of the recreation and agricultural economy of Park County by preventing additional large-scale exposures to sulfide-bearing ores that directly threaten local aquifers, Yellowstone National Park and the Yellowstone River.

Given these risks to our water, it is no surprise that more than 10% of the current Yellowstone Gateway Business Coalition membership is made of up fishing-related industry, including many of the top fishing brands and all of the major trade associations.

Wildlife

The impacts gold mining at the headwaters of major tributaries to the Yellowstone River, on the border of Yellowstone National Park, sandwiched amongst the Absaroka-Beartooth Wilderness, next to the Dome Mountain Wildlife Management Area and among the thousands of additional public and private acres will have on wildlife needs little introduction. Many words can be laid down outlining the research on species and potential impacts. The Greater Yellowstone Ecosystem (GYE) remains the largest fully-functioning in-tact temperate ecosystem on the globe. The withdrawal area proposed in S.941 has substantial marten, wolverine, bobcat, mountain lion, lynx, black and grizzly bear populations. Nesting sites for golden eagles, bald eagles, peregrine falcons, many species of owls and other birds are abundant. The headwaters (where mines would be located) provide cold, clean water for native trout and agriculture. As charismatic as these species are, it is the regions ungulate populations that are truly unique. Mule deer, big horn sheep,

pronghorn, bison and elk all require access to and use of both the public and private habitat, water, and relatively unfragmented lands north of Yellowstone Park.

The ground-breaking research by Arthur Middleton and the Wyoming Migration Initiative (www.migrationinitiative.org/) clearly shows a majority of the migration of the legendary "Northern Range" elk herd moves directly over Crevice Mountain and relies heavily on the surrounding lands included in the Yellowstone Gateway Protection Act.[4] These migrations are accurately referred to as the "heartbeat" of Yellowstone, with the Northern Range herd being among the most important and wide-ranging. The hunting, outfitting and wildlife viewing economy that relies on the integrity of this migration corridor is only outweighed by its ecological significance to all of Yellowstone and the surrounding public lands.

As a result, hundreds of businesses in Park County and beyond as well as every elected official and recent candidate from the local to state to federal levels have all agreed this is no place for a gold mine. This near unanimous bi-partisan agreement from locals includes Secretary of Interior Zinke, Governor Bullock, the entire Park County Commission, local MT House Representatives Alan Redfield and Laurie Bishop, the Honorable Senator Tester, the Honorable Senator Daines and the Honorable Representative Gianforte.

I thank you for the opportunity to present GYC's view on why the Yellowstone Gateway Protection Act is so important and why the Yellowstone Gateway Protection Act S.941 and the permanent protection of these lands is critical to the future of Park County and the Greater Yellowstone Ecosystem.

Respectfully Submitted,

Joe Josephson
Montana Conservation Associate
Greater Yellowstone Coalition
joe@greateryellowstone.org
(406) 556-2812

Attachments:

- Selected press clippings regarding proposed gold mines in Park County, Montana.107 pages
- A profile of Socioeconomic Measures, Park County MT. Produced by Economic Profile System. Headwaters Economics. http://headwaterseconomics.org/eps
- "Elk Migrations of the Greater Yellowstone Ecosystem." 2015 University of Wyoming. Atlas of Wildlife Migration: Wyoming's ungulates (in production).

---

[4] 2015 University of Wyoming. Atlas of Wildlife Migration: Wyoming's ungulates (in production). http://migrationinitiative.org/content/elk-migrations-greater-yellowstone

BILLINGS GAZETTE

Guest opinion: Daines holds up Yellowstone Gateway Act

- By ALEX PHILP
- Aug 5, 2017

The Outdoor Industry Association just released a new report proving that Montana's outdoor economy is bigger than anyone thought. The report detailed outdoor recreation activities such as camping, fishing and hunting, trail and water sports, and their part in contributing $7.1 billion to the state's economy. These activities support a love of the outdoors, but more importantly, they also support our way of life.

As an entrepreneur who has started several businesses in the state, I've witnessed firsthand how our public lands and outdoor amenities help business in Montana recruit and retain top talent. While all lawmakers should be expected to digest these new job numbers, there is one in particular who should study them very carefully: Sen. Steve Daines.

Daines is very good at sharing publicly his love for the great outdoors, whether it's his affinity for fishing streams, hunting, or hiking the Beartooth Mountains. As a Montanan, he understands the inherent face value of our landscapes. Unfortunately, the talk has not translated into action. These mixed messages are on full display in the current debate over whether to protect local businesses from the threat of industrial gold mining on the doorstep of Yellowstone National Park, within gateway communities that depend on outdoor amenities and clean air and water to support their livelihoods.

Disappointed businesses

Daines' comments and actions are at odds. He is confusing many local businesses and citizens who have asked for his help by saying one thing and effectively doing another. Daines recently told the Billings Gazette editorial board that he wants to protect the local economy and gateway of Yellowstone National Park. However, he disappointed many in the business community by stopping short of supporting the made-in-Montana solution that would accomplish this goal.

Instead he is delaying a solution by voicing his opinion that the current bill before Congress "won't go anywhere". He is suggesting a need to start over under the guise that what Montanans are asking for isn't 'balanced' enough for him. With all due respect, Senator Daines, we find these claims hard to believe. The Yellowstone Gateway Protection Act is well on its way, having already been introduced in Congress by Sen. Jon Tester and received a full Senate

subcommittee hearing. The legislation is simple and straightforward and doesn't impact private property rights. If it weren't balanced, it wouldn't have the support of the local community, 360 businesses, state lawmakers on both sides of the aisle and the Park County commission.

The only thing holding this bill back from advancing right now is bipartisan cooperation. The only thing holding that up is Daines. If he would look past the politics and work together with Tester, there would be a much higher probability of delivering a win for our outdoor economy and the many jobs that depend on the protection of the public lands in question.

71,000 outdoor jobs

The right thing to do would be for Daines to listen to the hundreds of businesses and local leaders who have helped craft a homegrown plan for supporting jobs on the doorsteps of Yellowstone. The legislation does not need to be over-complicated or burdened down by any attempts to 'balance' it. If the voices of 360 local businesses are not enough, please read through the Outdoor Industry Report and pay particular attention to these numbers:

- The recreation and outdoor-driven economy in Montana supports 71,000 direct jobs;
- This economy yields $2.2 billion in wages and salaries;
- The outdoor industry bolster's our state's well-being by providing $286 million in state and local taxes.

The outdoor industry is continuing to outgrow and outpace the economic impact of nearly every sector in the state. There is a perfect opportunity in front of our Montana delegation to demonstrate a commitment to protecting these outdoor jobs by working to protect the very thing that fuels this economy.

Senator Daines, please align your actions with your words. The numbers supporting the value of an outdoor recreation economy don't lie. If public lands are such a significant driver of Montana's economy, please explain why it is that you can't help us protect our livelihoods?

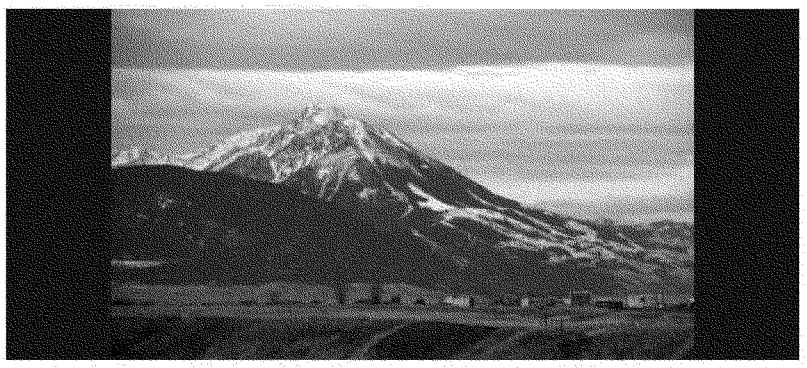
Alex Philp, Ph.D., lives in Missoula and is the founder of Upstream Health, GCS Research, TerraEchos, Adelos, N-Site, and RMSC

BILLINGS GAZETTE

GAZETTE OPINION

Gazette opinion: Time to protect Paradise Valley

Aug 1, 2017



Emigrant Peak towers over the Paradise Valley in Montana north of Yellowstone National Park.

Associated Press

To find an amazing example of Montana grassroots action, look no further than the Yellowstone Gateway Protection Act.

More than 360 businesses in Park County have united in the Yellowstone Gateway Business Coalition to protect the Paradise Valley between Livingston and Gardiner from large-scale mining development. At the request of the coalition, the Park County Commission and numerous individual local residents, U.S. Sen. Jon Tester introduced the Yellowstone Gateway Protection Act four months ago to make permanent a two-year pause in mineral development on 30,000 acres of U.S. Forest Service land. Part of this acreage is in Emigrant Gulch, where historic mining has long since been replaced by an economy based on agriculture, tourism, fishing, hunting and cross country skiing. The rest of the land that the coalition seeks to protect is on Crevice Mountain, right on the northern boundary of Yellowstone National Park.

Yellowstone's porch

A company with Australian connections has sought to mine on Crevice Mountain. A small Canadian company has plans for exploratory drilling on private land near Emigrant Gulch.

The Yellowstone Gateway Protection Act would not apply to private land. However, because public land adjoins the two proposed gold mine sites, the legislation would effectively stop large-scale mine development in the heart of the Upper Yellowstone River Valley.

Last Wednesday Tester's bill had a hearing before the Committee on Energy and Natural Resources Subcommittee on Public Lands, Forests, and Mining.

"God doesn't make places like this anymore, and we need to do what we can to protect them, and the jobs that come with them. Responsible natural resource development plays an important role in Montana's economy, but there are simply some places where you just should not dig or drill, and the front porch of Yellowstone Park is one of those places," Tester told the subcommittee on which Sen. Steve Daines serves.

Daines plans new bill

Daines agreed that: "The economy in this area thrives on our outdoor way of life."

"I support the withdrawal," Daines said repeatedly in a telephone interview Monday with The Billings Gazette, but he said that he plans to introduce his own bill, hopefully this fall.

"Jon's bill will go nowhere," Daines said. "We need a balanced bill."

Daines said he is working with House and Senate energy committee chairs "looking at different options" to get a withdrawal provision that can reach President Trump's desk. Daines said he couldn't yet talk specifics about "different options" he is working on.

At the hearing on Wednesday, Daines questioned a Forest Service representative about the environmental assessment under way as part of the two-year pause on leasing the public land at Emigrant Gulch and Crevice Mountain. That assessment is expected to be completed in the fall of 2018.

Gateway businesses want to see Tester's bill passed this calendar year, said Karrie Kahle, coalition spokeswoman at Chico Hot Springs.

Just last week, the Montana Department of Environmental Quality approved exploratory drilling for possible mining on private land in Emigrant Gulch. The DEQ has jurisdiction over mining on private lands, while mining on U.S. Forest Service land requires approval of that USDA agency.

The DEQ action "shows the urgency of getting the Yellowstone Gateway Protection Act passed to protect the public land," Kahle said.

Daines told The Gazette Monday that he understands the urgency, but wants to get a bill that will pass with bipartisan support. “We’re making progress, making some headway,” he said.

We call on Daines to stay focused on the protection of Yellowstone Gateway public lands and to steer a withdrawal through the Senate committee on which he serves and to passage as part of a bill that can be signed into law before Christmas.

In a letter sent to the Custer Gallatin National Forest earlier this year, Park County’s three commissioners summed up their support for permanently withdrawing these lands from mining: “Park County derives significant economic benefit from nearby, intact federal public lands. … The large-scale development of mineral resources in Park County has the potential to negatively impact natural resources, both during the life of the development and over the long term.”

Tester, Daines and Rep. Greg Gianforte already know those facts. It’s time for all three to act together to protect Yellowstone’s northern gateway.

BOZEMAN DAILY
CHRONICLE

Tester's bill too important for platitudes

Jul 30, 2017

The Montana Department of Environmental Quality last week granted permission for a mining company to drill exploratory holes on private land in Paradise Valley's Emigrant Gulch in its search for gold. The move constitutes the next step in the potential develop of a large-scale mine near Yellowstone National Park.

If exploration yields evidence of significant gold deposits on the small area of private land, the mining company will push for permission to mine on more than 2,000 acres of adjacent Forest Service land.

Mining is a necessary component of our national economy. But there are clearly places where mining and its substantial environmental impacts are inappropriate. The Emigrant Gulch plan — along with another proposal to mine on the very edge of the park near Jardine — are in such places.

Interior Department officials under the Obama administration placed a two-year moratorium on mining permits in these sensitive areas. A bill sponsored by Montana Sen. Jon Tester would make that permanent.

For the bill to have a chance, the other members of the Montana congressional delegation need to get behind it. But, so far, Sen. Steve Daines and Rep. Greg Gianforte have not convincingly said they will support the measure.

Tester's bill was given a hearing in a Senate committee meeting Wednesday. During the hearing, Daines, a member of the committee, said a lot of nice things about protecting Paradise Valley and the importance of Tester's bill. But he stopped short of saying he would vote for the measure. Gianforte, who said he opposes mining in the two areas near Yellowstone during his campaign for office earlier this year, is likewise reticent on the bill itself.

Daines and Gianforte, both Republicans, are likely to be subject to pressure from the industry-favoring Trump administration to oppose the bill by Tester, a Democrat. But this issue is too important for political posturing.

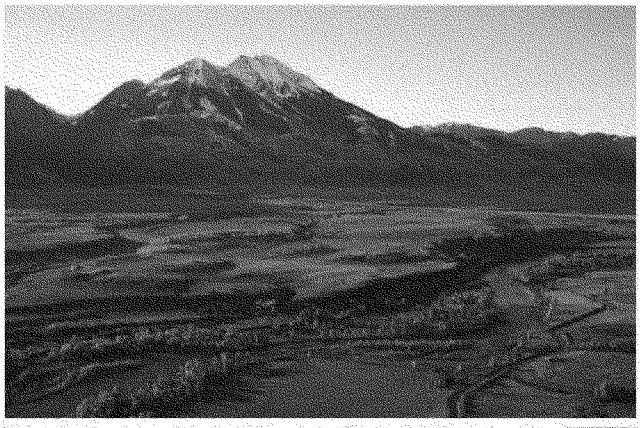
Issuing political platitudes on the importance of protecting sensitive areas isn't going to cut it. Daines and Gianforte should clearly state their support for S. 941, which will permanently withdraw mineral rights on a critical 30,000 acres of public land in Paradise Valley. Unanimity among the Montana delegation is the only way these protections are likely to be enacted given that Republicans control the House, Senate and White House.

Sen. Daines and Rep. Gianforte: Is it a yes or is it a no?

BILLINGS GAZETTE

Mine near Yellowstone gets DEQ approval for preliminary drilling

DAVID McCUMBER david.mccumber@mtstandard.com Jul 30, 2017



Emigrant Peak rises above the Yellowstone River in Paradise Valley. Emigrant Gulch, on the left side of the peak, is the area proposed for mining exploration.

BUY NOW

Larry Mayer, Lee Montana Newspapers

The state Department of Environmental Quality has approved exploratory drilling in a controversial gold-mining project in Emigrant Gulch, just north of Yellowstone Park.

Lucky Minerals, a Canadian company, has been interested in gold mining around Paradise Valley for several years. The company has bought up old claims and staked new ones covering a total of more than 2,500 acres. It says the acreage holds "a large-scale porphyry copper-gold-molybdenum system that could potentially host a multi-million ounce gold deposit."

DEQ Director Tom Livers said Friday that Lucky Minerals had actually agreed to mitigations associated with the exploration that were above and beyond what the DEQ had the statutory authority to require.

“There are things we can require under the Metal Mines Act and other things we can’t,” he said. “But once further mitigations are agreed to, we can enforce them.”

One of the things the company agreed to was to use Old Cemetery Road rather than driving trucks and equipment past Chico Hot Springs.

Also, the company agreed to monitoring water quality on Emigrant Creek. Lucky Minerals must also come up with a garbage-disposal plan to minimize impacts on wildlife.

Livers stressed that the approval is for exploratory drilling only and any expansion of mining activities would require a far more comprehensive environmental review and permitting process.

“The reality is we’re required by law to consider only what’s in front of us,” he said. “We can’t consider the impacts of an expanded operation in granting this approval. But any further work would require a separate application and a separate environmental review.”

Feedback

Local opposition to the project has been fierce.

Livingston, Emigrant and Pray residents have objected to the project, saying a big mine in the area would risk environmental disaster at the gates of America’s most treasured national park and also would have a negative effect on tourism, the lifeblood of the regional economy.

Colin Davis, owner of Chico Hot Springs, is leading the Yellowstone Gateway Business Coalition, a group of 360 businesses and landowners opposed to mining on the edge of Yellowstone.

"We're pro-private property rights and not anti-mining at all," Davis says. "We're against industrial-scale gold mining in the Paradise Valley."

Last year local writers and editors combined forces on a book, “Unearthing Paradise,” encouraging political action to block gold mining near the park.

U.S. Sen. Jon Tester, D-Montana, in April introduced legislation, the Yellowstone Gateway Protection Act, to permanently halt mining on federal land surrounding Paradise Valley. At the time, Tester said with more people visiting national parks each year, and the reliance of area businesses on the health of the environment, the legislation was needed to protect current and future generations.

The Lucky Minerals claims are partly on private land and partly on public land, but the buffer zones in federal land that would be withdrawn from mining under the bill would make industrial-scale mining all but impossible on the site.

While U.S. Sen. Steve Daines, R-Mont., has voiced support for protecting the area around the park, he has stopped short of supporting the bill Tester introduced. He is in a position, as a majority member of the Senate Committee on Energy and Natural Resources, to help push the bill forward.

"We need the help of our entire delegation," Davis said. "This isn't Jon Tester's bill, this is Montana's bill. Its language is pretty straightforward."

Davis added that the DEQ approval "points out the urgency for our congressional delegation to unify and act together to shepherd the Protection Act through."

On Friday, Tester said, “It makes no sense to mine at the headwaters of the Yellowstone River and on the doorstep of our nation’s first national park. These mines will do irreversible damage to Montana's outdoor economy and the jobs it supports.”

A Daines spokesman said Friday evening, "Sen. Daines opposes mining in this area, but he is still weighing the best way to achieve the withdrawal.”

Daines said after a committee hearing on the bill, "I am committed to continue to work with Senator Tester and local stakeholders on this important legislation. ... It is important to me that in any major land decision like this one, that the local community stands firmly behind it. The county commissioners, the other local elected officials, local businesses, and outdoor businesses like the fly-fishing industry support the withdrawal. I can say with confidence that after the meetings I have had that most of the community does stand with this mineral withdrawal."

DEQ will set a bonding amount for the exploratory work, which must be paid in cash before that work can begin.

“That’s one hurdle done,” Lucky Vice President Shaun Dykes told The Bozeman Chronicle Thursday. Efforts to reach Dykes Friday were unsuccessful.

On its website, the company says that 10 “highly mineralized breccia-pipes and two porphyry targets exist within the company’s property boundary.” Breccia pipes are geological formations that can be hosts for metal ore deposits. Porphyry deposits often enclose copper, gold and molybdenum.

A second proposed mine near Jardine, closer to the park's north entrance, has been stalled after DEQ twice rejected applications from a Spokane company, citing multiple deficiencies in its exploration plans.

BILLINGS GAZETTE

Gold mining proposal near Yellowstone advances

Associated Press Jul 26, 2017

Emigrant Peak towers over the Paradise Valley in Montana north of Yellowstone National Park. Associated Press

Montana environmental regulators say a Canadian company can move forward with plans to explore for gold in an area north of Yellowstone National Park despite local opposition.

The Montana Department of Environmental Quality on Wednesday released a months-long evaluation of Lucky Minerals' exploration proposal. State officials said the company had agreed to extensive water quality and wildlife monitoring plans.

Local residents are concerned that mining could harm the local tourism industry and pollute the nearby Yellowstone River.

Legislation proposed by Montana's Democratic U.S. Sen. Jon Tester would bar future mining claims on 30,000 acres of public lands outside Yellowstone.

Lucky Minerals' proposal is on private land, but officials say it might not be economically viable without mining on adjacent public lands.

Republican Sen. Steve Daines says he opposes mining in some areas outside Yellowstone National Park but stopped short of endorsing proposed legislation on the matter from a fellow Montana lawmaker.

Daines appeared to speak favorably of Tester's bill to block Yellowstone-area mining during a Wednesday hearing before a Senate committee.

But a spokeswoman said afterward the Republican still is weighing the best way to achieve the withdrawal of lands outside the park from future mining.

Daines has said previously that property rights also must be respected.

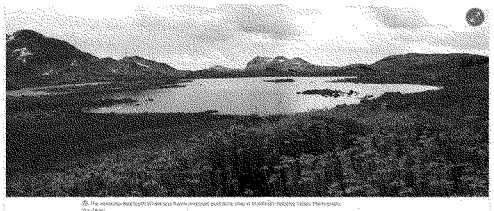
Federal officials last year placed a two-year halt on new mining claims on 30,000 acres of federal land outside Yellowstone at the urging of Tester and local officials.

Two gold exploration projects are proposed on private land in the same area.

theguardian

Public lands: the land is our land

More valuable than gold: Yellowstone businesses prepare to fight mining



The Absaroka-Beartooth Wilderness flows through and into the park in Montana's stunning Paradise Valley. Photograph: Guy Cheny

3656 134

Elliott D. Woods in Livingston, Montana

Sunday 16 July 2017 07.00 EDT

Gordon's Cessna Centurion floats off the runway south of Livingston, Montana, quickly escaping the confines of Paradise Valley, walled on both sides by the Absaroka and Gallatin mountain ranges. Snaking through the alfalfa fields, cottonwood thickets and ranches below, the Yellowstone river is still surging with late spring snowmelt.

As soon as we crest the ridges, the whole of Yellowstone national park is visible to the south, with Grand Teton towering on the far horizon. Places that would take hours to drive between – because of impassable mountains and roadless wilderness – are revealed to be only a handful of miles apart. The nearly 1m acres of the Absaroka-Beartooth Wilderness is spread out to the east, teeming with unseen elk herds, mountain lions and grizzly bears. Gordon, who runs the nonprofit EcoFlight, based in Aspen, Colorado, pilots flights like this one to help people understand conservation issues with a view from above. "We're coming up on Emigrant Gulch now," Joe Josephson, sitting in the co-pilot's seat, says over the intercom as we fly over the green-roofed buildings of Chico Hot Springs resort, skirting the conical 10,915ft Emigrant Peak. Josephson, an avid mountaineer who recently summited Emigrant Peak to celebrate his 50th birthday, is the Montana Conservation Associate for the Greater Yellowstone Coalition, a nonprofit devoted to defending the 20m-acre Yellowstone ecosystem from degradation.

The St Julian claim site up Emigrant Gulch as seen from the northeast. The reddish stains on the mountainside indicate the potential for gold below the surface. Photograph: Elliott D. Woods/Elliott D. Woods 2017

We have taken to the skies on this late June morning to view the sites on the northern fringe of Yellowstone Park where two mining companies want to dig exploratory holes thousands of feet into the mountains. The Paradise Valley – as this stretch of the Yellowstone river valley between the park and Livingston is known – is no stranger to hard-rock mining. The town of Emigrant, at the foot of the iconic peak that bears its name, was settled by miners in the late 1800s, when the area was still Crow country. Right on the edge of what would eventually become Yellowstone national park, miners built the village of Jardine, where the last industrial gold mine shut its doors in 1996.

But these days, mining is mostly a relic of history in the Paradise Valley, where tourism and outdoor recreation have long since seized the reins of the regional economy. In November 2016, responding to outcry from local business and residents over the perceived threats posed by the dual mining proposals, former interior secretary Sally Jewell announced a two-year moratorium on new mineral leases on 30,000 acres of federal public land in the Paradise Valley. In April of this year, Montana senator Jon Tester, a Democrat, introduced a bill that would make the moratorium permanent. Mine opponents are thrilled, but the bill faces a hard road forward in a Senate dominated by Republicans who share President Trump's commitment to expanding the extractive industries' footprint on public land.

Gordon wheels around to the east, giving us a view of a rarely seen bowl beneath the north face of Emigrant Peak, bare of snow and striped with rusty hues. "That's the St Julian Claim," Josephson says, indicating an area of private land several acres wide, flanked on all sides by the Custer-Gallatin national forest. "That's where Lucky Minerals wants to drill."

The reddish stains are the result of materials in the sulfide ore body that react to air and water and have the potential to produce acid runoff. They're also an indication of what may be hidden below: gold. Lucky Minerals, a Canadian company, is behind the Emigrant Gulch project, an exploratory operation that would involve 46 drill holes on 23 pads, and in Lucky's best case scenario, would result in the discovery of gold deposits significant enough to merit industrial development.

Crevice Mountain Mining, which is majority Australian-owned, is pursuing a separate exploration project in the hills above Jardine, almost within sight of the Roosevelt Arch, Yellowstone's historic entrance. Locals worry that industrial mining on the site might contaminate the river and the aquifer below, with disastrous results for the hundreds of businesses that rely on the upper Yellowstone river watershed, the surrounding mountains, and the national park to draw the tourists who spend about $1bn annually in the five counties surrounding Paradise Valley – dollars that generate 13,250 jobs, according to research compiled by Dr Larry Swanson, an economist who runs the University of Montana's Center for the Rocky Mountain West.

Concerns over the perceived threat to the watershed have prompted more than 350 Montana businesses and organizations to join the Yellowstone Gateway Business Coalition, which formed in 2015 with the goal of blocking new mining permits on the forest service land adjacent to Emigrant Gulch, and later expanded its objective to include the area around the proposed Crevice site. The members include an unlikely mix of old-school hunting outfitters and ranchers and "new west" businesses like Livingston's Katabatic Brewing Company and the Flying Pig Raft Company in Gardiner. There are also some international heavy-hitters on the roster, including Costa Sunglasses, Orvis and Simms Fishing Products, a manufacturer of Gore-Tex fishing waders and apparel that employs 180 people at its headquarters and factory outside Bozeman. As one member told me: "We have people with peace sign bumper stickers on the backs of their Subarus and folks who think Rush Limbaugh is too liberal."

The coalition represents a new political force in the western US that is flexing its muscles on behalf of conservation and environmental prerogatives and starting to compete with traditional political powerhouses – the agricultural and extractive industries – for the attention of elected officials. The coalition's slogan, plastered on bumpers and yard signs all over southwest Montana, is "Yellowstone is more valuable than gold".

Of course, for anyone who might want to work on the exploration projects, the slogan falls flat. Dr Michael Werner, an engineer who is spearheading the Crevice Mountain proposal, told the Billings Gazette that a fully operational mine on the site would bring in about $7.5m in annual wages to Park County. Werner's forecasts aren't drawn from thin air – the Mineral Hill mine, which operated close to the Crevice site until 1996, employed 120 and had a $7m annual payroll. Historically, dreams of the next grubstake haven't been

hard to sell in Montana, where the state flag bears the slogan "Oro y Plata" or "Gold and Silver" beneath a tableau that includes mountains, a shovel and a pick.

While the heyday of mining in Montana has long passed, the industry remains one of the state's economic pillars. Two valleys over, on the edge of the same Absaroka-Beartooth Wilderness that flanks the proposed Paradise Valley mines, the Stillwater Mining Company employs 1,400 workers at the country's only platinum-palladium mining operation. In May 2017, Stillwater sold to a South African firm for $2.2bn.

Mine supporters highlight the fact that the 1978 law that designated the boundaries of the Absaroka-Beartooth Wilderness intentionally excluded both the Emigrant Gulch and Crevice Mountain sites because of their mineral potential and their historic mining activity. They're concerned that Senator Jon Tester's bill could set a precedent that would encourage environmental activists to fight for more permanent legislative withdrawals. Tester, a Democrat from Montana, has introduced a new bill that would permanently bar new mineral leases on 30,000 acres of federal forest land north of Yellowstone Park, to include the areas around the proposed gold exploration sites.

But mine opponents say that the times and the priorities have changed in places like Paradise Valley. As in much of Montana, the tourism and recreation economy is the undisputed king in Park County, which links Interstate 90 – a major thoroughfare for western roadtrippers – to the northern entrance to Yellowstone Park, one of just five entrances through which more than 4 million visitors passed last year. Even businesses that have no direct tie-in to the outdoor industry, like Livingston's Printing for Less – a founding member of the YGBC – still rely on the area's world-class natural assets to recruit and retain employees. They're quick to point out that the leisure and hospitality sector – just one of several sectors tied to tourism and recreation – accounts for over 65,000 jobs in Montana, whereas mining and logging, which are lumped together, account for about 7,300, according to the US Bureau of Labor Statistics.

But if you're one of the few thousand people in Montana who make a living off hard rock, the prospect of working at one of two new gold mines in Yellowstone country for a six-figure wage is probably more appealing than slinging beers at a brewery or working a season on the river as a raft or fishing guide. And you're probably short on sympathy for the concerns of real estate brokers who fear that the proximity of the mines might diminish the value of multimillion dollar vacation ranches.

The rub, according to Josephson, is that not all mines, or mining jobs, are created equal. He argues that the Stillwater mine is vital because it's the nation's only source of platinum and palladium ore, and one of only two such mines in North America. Platinum and palladium are used in the manufacture of catalytic converters, which reduce the toxicity of vehicle exhaust gases. By contrast, there are several dozen industrial gold mines scattered across the western US with 3,000 tonnes of proven in-ground reserves – in a word, the US isn't desperate for gold the way it is for platinum and palladium. Additionally, Stillwater County, the site of the platinum-palladium mine and its associated smelters, is heavily dependent on the economic activity generated by the mines, whereas Park County is heavily dependent on tourism and recreation and the pristine natural beauty required to keep the visitors coming.

"Usually these kinds of mining jobs are very short term, and the real jobs come around in the cleanup after the mines have been built," said KC Walsh, president of Simms Fishing Products, referring to the type of gold mining activity that might result from the proposed exploration.

Montana's groundwater and landscapes have paid a heavy price for the wealth generated by the state's mining history: there are eleven mining-related Superfund sites in Montana, areas designated by the Environmental Protection Agency as so polluted that they require long term, federally administered mitigation efforts.

"What we're trying to do here at Simms is provide jobs that give good compensation, that will last a long time, and help support our state," Walsh said.

Tammy Johnson, executive director of the Montana Mining Association, said she understands that people are "afraid of the unknown", but she thinks the outcry over the exploration proposals puts the cart before the horse. "These projects have a long way to go before anything would or could become a mine. These are both just exploration projects that have to be analyzed and permitted by the state," she said. Referring to

Senator Tester's bill to permanently block new mineral leases in the area, Johnson said: "We're kind of proposing a nuclear option for something at this point that doesn't warrant it."

Wounded Man Lake from a point near Rainbow Creek Divide, now within the Absaroka-Beartooth Wilderness. Custer National Forest, Montana, 1938. Photograph: RD Swan/Forest Service

In December 2016, before his nomination as Sally Jewell's replacement, former Montana congressman Ryan Zinke expressed his opposition to gold mining in the Paradise Valley. His replacement, Greg Gianforte, a Republican from Bozeman, also opposes the mines, though he has not commented on Senator Tester's bill.

Currently, both mining companies are working with the Montana department of environmental quality to get permission to drill on private land, but according to Josephson, "There's only one outcome or goal of exploring and that's to dig a big mine." To dig an industrial-scale mine at either site would require expanding onto public land, Josephson said. "There's less than a half ounce of gold per ton of ore. They'd have to take out tons of rock."

Along with the specter of poisonous runoff, mine opponents worry about the disturbance to the serene Paradise Valley that would be caused by convoys of heavy trucks laden with ore and the noise of drilling equipment. Of all the businesses aligned with the coalition, Chico Hot Springs resort – over a century old, beloved by locals and tourists alike – would have the worst seat in the house: the forest road that leads up to the St Julian drill site runs straight through the resort's parking area. Karrie Kahle, Chico's special events coordinator, summed up the community's feelings bluntly: "The mines are a threat to our way of life."

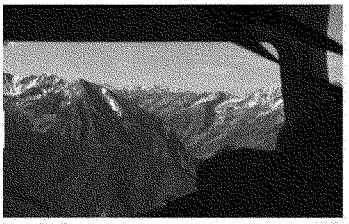
The Trump administration has made it clear that as far as they're concerned, public land is open for business. But there's still a lot of red tape between the proposed exploration projects in the Paradise Valley and the realization of industrial gold mines on the sites.

Still, Kahle and her allies are determined to prevent the proposals from even entering into a federal permitting and leasing process that they believe privileges industry over communities. Referring to Senator Tester's bill, she said: "It would be nice to get the kill shot now."

BOZEMAN DAILY
CHRONICLE

Paradise Valley mine opponents pressuring Daines to support Tester's ban

By Michael Wright Chronicle Staff Writer Jun 22, 2017



LIVINGSTON — It has been nearly two months since Montana's Democratic U.S. Sen. Jon Tester introduced a bill to ban new mining claims on 30,000 acres of public lands east of the Paradise Valley, and supporters of the measure want to see the bill get a hearing.

And, they'd like to see Republican Sen. Steve Daines, who has not expressed support for the bill, help with that.

"We want Daines to ask that this bill gets a hearing, and it needs to happen soon," said Karrie Kahle, the special events coordinator at Chico Hot Springs and a member of the Yellowstone Gateway Business Coalition. To keep up the pressure, the YGBC and the Greater Yellowstone Coalition organized a media flyover of the Absaroka Mountains this week. They pointed out the two sites where companies have asked for permission to look for gold, and they pointed out where Tester's bill would permanently ban new mining claims.

The saga began in 2015, when two companies proposed separate exploratory drilling projects on private lands. Lucky Minerals Inc., a Canadian company, proposed drilling in Emigrant Gulch. Crevice Mining Group, based in Spokane, Washington, proposed looking for gold on Crevice Mountain, near Jardine and the border of Yellowstone National Park.

Opponents of the two projects began asking for a mineral withdrawal in 2016. In November, then-Secretary of the Interior Sally Jewell granted their wish with a temporary ban on new claims in the area, something the opponents of mining the area celebrated. But the only way to permanently ban new claims is through legislation, which is why they are pushing for Tester's bill. They worry mining will threaten the region's tourism-based economy.

"The economy we have right now is a sustainable economy," Kahle said.

No other member of the Montana delegation has expressed support for Tester's bill. Newly minted Congressman Greg Gianforte told the Chronicle editorial board last month before he was elected that he agreed with the "sentiment of Tester's bill," but that he didn't think it would pass both houses in its current form because of property rights concerns.

Daines has not come out against the two mining proposals, and his reasoning for not supporting the Tester bill also centers on private property rights. A spokesperson for Daines said in an email that unpatented mining claims in the withdrawal area have value, and that those claimants and the state may need to be compensated.

"The claimants and the state needs to be made whole to ensure no economic activity is lost," the spokesperson said.

The spokesperson also said that Daines is using the temporary ban to "examine the best path forward that respects private property rights and protects this area."

Kahle, with the business coalition, said Daines' reasoning "doesn't quite make sense."

"We also just don't understand why he would want to give special treatment to two mining companies over his constituents. That seems to be what he's doing," she said.

The bill would not directly affect the two companies trying to look for gold in the area, though it could harm their ability to expand. Both have staked claims on federal land that would be left intact, and both are working with the Montana Department of Environmental Quality to obtain permission to explore on private land.

Lucky Minerals is closest to getting approval for their project. Kristi Ponozzo, the director of public policy for DEQ, said the agency expects to release a final environmental analysis of Lucky's proposal sometime next month. A draft version of the document recommended that the company be allowed to proceed.

Crevice Mining Group has been asked to resubmit its application to DEQ twice. It has not responded to the second deficiency letter that DEQ sent to the company. But Ponozzo said the agency has talked with the company recently about how it can move forward.

THE LIVINGSTON ENTERPRISE

Aerial view of Emigrant Peak in Paradise Valley, Montana. (Photo by William Campbell)

By: Liz Kearney
Enterprise Staff Writer

Locals seek action from Steve Daines on fed mining ban

Published by admin on Tue, 06/20/2017 - 2:28pm

Area business owners who want to see some local public lands permanently withdrawn from mining are asking Congress to get moving on legislation introduced two months ago.

Sen. Jon Tester introduced the "Yellowstone Gateway Protection Act" in the U.S. Senate in April. Tester drafted the bill on the request of area business owners with the newly formed Yellowstone Gateway Business Coalition.

The bill is currently before the Senate's Energy and Natural Resources, of which Sen. Steve Daines is a member.
"We're asking Sen. Daines to request a hearing of the bill by July before the August recess," Karrie Kahle, a spokeswoman for the YGBC said Monday. "We're urging him to support his constituents in our

community and to act for a hearing and get this bill passed to protect our economy and our way of life.... He's our Congressman, and we'd like to have his support on the act."

The bill, S. 941, permanently withdraws federal mining rights on 30,000 acres of public land in the Custer Gallatin National Forest adjacent to the Absaroka Beartooth Wilderness and Yellowstone National Park. It also eliminates the ability for proposed mines to expand onto unclaimed public land.

Tester's bill expands the Interior Department's 20-year prohibition on new mineral rights claims on the same public lands.

Kahle said the YGBC has asked several times to meet with Daines, but have not been able to so far.

"At this point he's not getting back to us," Kahle said. "He's said time and time again he's listening. We want him to think about his constituents and the Park County community and the sustainable economy we have. He should be our guy. He's our senator, this is his state. We don't want to see special treatment given to foreign mining companies."

Passing the act could save the U.S. Forest Service and the Bureau of Land Management the trouble and expense of a two-year study of the lands under consideration, as well as about $2 million, Kahle said.

The business coalition, who met with Representative-elect Greg Gianforte in April, secured Gianforte's support for the mining ban. And Secretary of the Interior Ryan Zinke has said in the past he, too, opposes mining near the park.

"There's places to mine. I just can't see where mining around Yellowstone National Park or Glacier meets the greater good," Zinke told The Enterprise last year.

Kahle said she hopes Gianforte, who is scheduled to be sworn into the U.S. House of Representatives Wednesday, will support a House version of S. 941 once he gets settled into his new position.

Paradise Valley resident Jeff Reed said Tuesday he has been in contact with Daines' office, too, urging him to support the permanent withdrawal. Reed notes that Daines has suggested in emails to him that he has concerns about private property rights. Reed points out that this bill does not involve private property and does not impact current applications in place on private mining claims.

Reed said he sees the mining withdrawal as a bipartisan issue.

"I would like to see both Daines and Tester get together on this," Reed said. "As a lifelong Republican myself, this is a pro-business move. I'm wondering, as a Republican, why Daines won't get behind this because it's probably going to save us taxpayer dollars on a two-year study, as well as being for the sake of the land itself."

BILLINGS GAZETTE

Protect Yellowstone River

Jun 9, 2017

As an angler of the Yellowstone River for the past two decades, I applaud Sen. Jon Tester's introduction of the Yellowstone Gateway Protection Act last week, which proposes 30,000 acres of public land be off-limits to industrial gold-mining. Locals — including 340 regional businesses with the Yellowstone Gateway Business Coalition — have asked for this. We have a senator who hears us and is willing to help us with this fight.

The Yellowstone River isn't just a Montana treasure, it's our national treasure — Montana just happens to be the steward of America's iconic waterway. We have a responsibility to the millions of visitors who come to our state for our blue-ribbon fisheries to keep them pristine. This bill protects our right to do business here, which I remember each day I take a client on the river.

We all had a scare last summer with the river closure, and we recognize we're dealing with a dynamic and fragile system. Any further stressors of industrial development near the river and its tributaries jeopardize my livelihood and the economic stability of our gateway communities — including Billings.

Join me in supporting this bill as it moves through Congress. If there's one thing we can all agree on, it's that summer is around the corner, and it's time to spend days on the water. Let's make sure that never changes.

Tyson Nunley

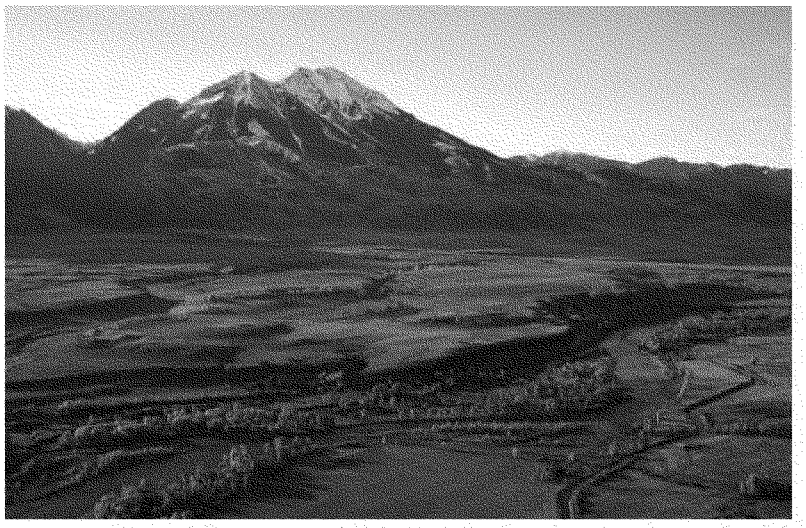
Billings

BILLINGS GAZETTE

GAZETTE OPINION

Gazette opinion: Permanent protection for Paradise

Jan 3, 2017



The Yellowstone River flows through the Paradise Valley north of Yellowstone National Park.

LARRY MAYER, Gazette Staff

BUY NOW

Residents and businesses in Paradise Valley have been fighting to protect their way of life from foreign mining interests for the past two years.

They need the help of Montana's entire congressional delegation to succeed.

So far, these Montanans have persuaded the U.S. Forest Service and Bureau of Land Management to put a two-year pause on any development on 30,000 acres of federal public lands. Part of the land is at Crevice Mountain, right on the border of Yellowstone National Park near Gardiner. A company with Australian ties has sought a state permit to begin mining there on private land.

The rest of the public land that has been put off-limits to hardrock mining for two years is near Emigrant Gulch in the vicinity of Chico Hot Springs. A small Canadian company is pursuing state permits to explore mining potential on private land adjoining national forest.

The Yellowstone Gateway Business Coalition of 360 area businesses has stepped up to ensure that mining doesn't degrade the Yellowstone River and the beautiful landscapes that draw millions of vacationers, hunters, anglers and hikers to Yellowstone's northern gateway.

In March, Sen. Jon Tester, D-Mont., introduced the Yellowstone Gateway Protection Act, S.941. The bill is brief and to the point: It would make permanent the two-year withdrawal of federally owned minerals on the same 30,000 public acres north of Yellowstone.

Interior Secretary Ryan Zinke endorsed this gateway land protection last summer while running for re-election to the U.S. House. He reiterated his support after being nominated to lead the Interior Department. Greg Gianforte, who last week was elected to fill the House seat Zinke vacated, is on record in support of Tester's bill. The key public servant missing on this public land issue is Sen. Steve Daines, R-Mont. Daines' support is crucial because he is chairing the Senate Subcommittee on National Parks, the panel that needs to hold a hearing and approve the Yellowstone Gateway Protection Act.

No hearing on the gateway bill has been scheduled.

The Gazette asked Daines' spokeswoman what his position is on S.941. Via email, Daines responded: "We need to protect this Montana treasure while also respecting private property rights and that's what's missing if we want to see this bill signed into law."

It's unclear exactly what Daines wants changed, but it sure sounds like he's talking about extra-special protection for mining interests in an area that shouldn't be mined. Tester's bill contains the legal boiler-plate language for withdrawing federal minerals from hardrock mining development, nothing more.

The bill doesn't cover private land or privately owned minerals. It's large-scale mining involving public property that the local outfitters, guides, innkeepers and restaurateurs fear.

Tester's bill adequately and properly addresses the "valid existing rights" Daines told us he wants to protect. Owners of claims in the proposed withdrawal area are exempt from the withdrawal if they can demonstrate a "valid existing right" to mine as defined in case law stretching back over the past century.

"We're fighting to protect our jobs. What about our property rights?" Karrie Kahle asked in a meeting with The Gazette last week. Kahle, the special events coordinator at Chico Hot Springs, worries what a large open-pit mine would do to her business. Many of Kahle's neighbors share her concerns.

The Park County economy runs largely on the $200 million that Yellowstone Park visitors spend annually. The county also has 564 farms and ranches that depend on clean water.

Commenting on Tester's bill, Park County Commissioner Steve Caldwell said: "The withdrawal also helps maintain the long-term viability of local public finance revenues while respecting the integrity of private property rights."

Daines' stated concern is addressed in S.941. The senator from Bozeman should talk more with Tester, and join the rest of the delegation, park county's local elected representatives and 360 area businesses in supporting the Yellowstone Gateway Protection Act.

We call on Daines as subcommittee chairman to hold a hearing on this Montana legislation before Congress takes its five-week summer break in August. This bill should be a high priority for Daines because it's a high priority for Montanans.

BOZEMAN DAILY
CHRONICLE

Delegation must keep up fight against mine near YNP

By Sabina Strauss, Richard Parks, Nathan Varley, guest columnists Jun 3, 2017

We are members of the Yellowstone Gateway Business Coalition. We have worked hard to build our businesses on the threshold of Yellowstone, some of us for decades, some for over 100 years. Our businesses rely on the integrity of our local landscapes, abundant wildlife, pristine watersheds, our unspoiled scenic beauty, and our precious quality of life that is known and revered around the world. Whether to draw visitors for our thriving tourism economy or to recruit world-class talent for our emerging high-tech jobs, we need to protect the natural assets that draw people (and their spending power) here in the first place.

We've spent the past two years asking our Montana representatives to protect our jobs from risky new large-scale gold mining at Yellowstone's gateway. So we were delighted when Sen. Jon Tester introduced the Yellowstone Gateway Protection Act in April. The bill will keep these gold mine proposals away from more than 30,000 acres of our public lands north of Yellowstone. It will protect our local economy and our way of life.

Opposing gold mining north of the park has near-unanimous support in the valley and throughout southwestern Montana. Local people like us – the 350+ businesses in the Yellowstone Gateway Business Coalition – asked for this bill. We want to protect our economy and our way of life from mines proposed by two fly-by-night foreign mining companies. Local water rights holders and fishing businesses are with us.

This isn't a political issue. Protecting our economy cuts across party lines, which is why local electeds from both parties oppose mining at the gates of Yellowstone. The entire Park County Commission is with us, as are the folks who represent us in Helena. Both Democratic and Republican candidates for Montana's House seat publicly opposed gold mining next to Yellowstone, and we're looking forward to working with our new Rep. Greg Gianforte. And Ryan Zinke, who opposed the Yellowstone gateway mines as our Republican congressman, has continued opposing the mines as interior secretary. He posted on Facebook this spring: "The gates of Yellowstone are not to be mined."

Such tight bipartisan agreement is rare in 2017, which underlines what a very bad idea gold mining is here. It risks our economy and our jobs, including the $196 million Park County saw in money spent by non-residents in 2014. It risks an accident that would shut the Yellowstone River for far longer than the few terrible weeks we experienced during last summer's fish kill. And our supposed benefit for taking these risks? Ten jobs proposed by the Canadian company that wants to explore up Emigrant Gulch. Ten jobs that won't even be filled by anyone from Park County. And can this Canadian company, Lucky Minerals, even pony up the minimum in bonding to protect us if something goes wrong or if they simply leave?

This bill is the solution we've asked for, for two reasons. One, you can believe in small government and support this bill. Passing a law is the most efficient way to protect us – it saves the Forest Service $2 million and two years. It's streamlined and gives us Montana business owners the certainty we need. We want this to be done. We don't want our kids to have to fight this battle again in 20 years.

Two, this bill protects private property rights. It has the same wording as every other bipartisan bill like it that Congress has passed over the decades. Anyone who asks for extra wording beyond what's currently in the bill is asking for special treatment for these mining companies. We are having a hard time understanding why anyone would go to bat for these companies, which don't even have storefronts in Montana, and which certainly aren't Montana constituents.

We encourage our Montana delegation to work together to pass this bill. Join us, 350 other Montana business owners, and our local elected officials to protect our jobs, property and the national park from gold mines at Yellowstone's gateway. Yellowstone is more valuable than gold!

Sabina Strauss represents the Yellowstone Basin Inn in Gardiner, Richard Parks the Parks' Fly Shop in Gardiner and Nathan Varley the Bear Creek Council in Gardiner.

BOZEMAN DAILY
CHRONICLE

Thanks to Sen. Tester for his stance on Yellowstone

By Gillian Cleary May 18, 2017

It is with great gratitude that I support Sen. Tester and his introduction of the Yellowstone Gateway Protection Act. This crucial legislation seeks to permanently protect 30,000 acres of public land from the lasting damage of industrial gold-mining.

Locals—including myself and 340 regional businesses in the Yellowstone Gateway Business Coalition—ask that this critical step be taken. On this and other issues, I am grateful that Sen. Tester listens to Montanans and acts on his constituents' concerns.

As a Bozeman High graduate, some of my fondest memories stem from time spent in Paradise Valley, Yellowstone National Park and the unique and valuable wilderness of Southwest Montana. Returning home to Bozeman as an adult, it has been disappointing to learn of mining threats on the doorstep of Yellowstone. These mining initiatives seek to inflict lasting environmental (and therefore economic) damage on our region, while providing minimal local job creation and zero reinvestment in Park County. It is impossible to recreate whole, mature wilderness and ecosystems, and intact public lands are key drivers of Park County's strong economy.

We don't need to look far to see the lasting damage caused by mining in Montana communities. Paradise Valley truly is a treasure to be protected, and it is up to us to ensure that the Greater Yellowstone Ecosystem survives for the benefit of future generations.

Finally, I would like to thank the Bozeman Daily Chronicle and the Livingston Enterprise for their editorial boards' support of this legislation. This issue has already mobilized support from both sides of the political aisle, and we ask all Montanans to join us in supporting the Yellowstone Gateway Protection Act as it moves through Congress. We can all agree: It's time to get out to enjoy the gorgeous gateway to Yellowstone—a land more valuable than gold.

Gillian Cleary

Bozeman

BILLINGS GAZETTE

Yellowstone more valuable than gold

May 6, 2017

I've been hunting the public lands in the Paradise Valley for over two decades. I'm also on the board of Montana's oldest sportsmen's group, the Montana Wildlife Federation.

I support Sen. Jon Tester's Yellowstone Gateway Protection Act, because it keeps fly-by-night companies from developing risky gold mines on our public lands north of the Yellowstone. This bill means cold, clear water for trout, boaters and irrigation. It means elk and big horn sheep can keep migrating in and out of the park. It recognizes the Yellowstone River as the pulsing, living, main artery of my home, Paradise Valley.

Our ranches, our recreation, our families, our jobs, if not our very souls, all rely on this same clean water and access to our public lands. More than 350 local businesses, every elected official in the county and thousands more individuals have banded together to protect our right to this heritage from sketchy prospectors with gold fever set on gambling with our future. Please join us (dontmineyellowstone.com) and protect public lands in the gateway to Yellowstone. Yellowstone is more valuable than gold.

John Salazar

Livingston

THE LIVINGSTON ENTERPRISE

ENTERPRISE EDITORIAL: Ryan Zinke's chance

Published by Enterprise Staff on Tue, 05/02/2017 - 3:18pm

The Yellowstone snakes through the Paradise Valley in this aerial image captured on June 5, 2015. (Enterprise photo by Hunter D'Antuono)

By:

Justin Post
Enterprise Managing Editor

U.S. Sen. Jon Tester recently made good on his promise to introduce legislation aimed at halting future mining on the doorstep of Yellowstone National Park.

Many Park County residents applauded Tester for introducing the Yellowstone Gateway Protection Act, which would permanently remove federal mineral rights on some 30,000 acres of public land in the Custer Gallatin National Forest near Yellowstone National Park and the Absaroka Beartooth Wilderness.

"My bill will be effective in stopping large-scale mining in the valley," Tester said during a recent conference call with reporters.

It's difficult to understand why anyone would support large-scale mining on public land in Paradise Valley. Yet in the days since Tester introduced his bill, some have questioned whether Tester's bill stands a chance of becoming law.

Perhaps that's because President Donald Trump is seen as a leader who supports energy development. But this isn't a cut-and-dried issue favored exclusively by one party and opposed by another. You don't have to be anti-mining to support Tester's bill. You simply have to understand that some areas, such as Paradise Valley and the land surrounding Yellowstone National Park, are simply not ideal locations for large-scale mineral extraction.

Both candidates — Republican Greg Gianforte and Democrat Rob Quist, seeking the U.S. House seat vacated by Ryan Zinke — have made public statements opposing two mining proposals near the park.

And Zinke, who was appointed by Trump as the new Secretary of the Interior, told the staff of this newspaper last summer that he, too, opposes mining adjacent to national parks.

"There's places to mine. I just can't see where mining around Yellowstone National Park or Glacier meets the greater good," Zinke said.

Let's hope Zinke works to help shepherd Tester's bill through the political process and encourages President Trump to sign the bill into law.

Now that's a picture we would like to see: Ryan Zinke, Tester and many Livingston and Paradise Valley residents and business owners crowded around Donald Trump during a signing ceremony for the Yellowstone Gateway Protection Act.

This is a unique opportunity for Trump, Zinke and our congressional delegation to unite on this important issue. Montana voters send elected officials to office because they align with our values and pledge to look our for our best interests back in Washington, D.C.

Let's hope they, too, will make good on that promise.

BOZEMAN DAILY
CHRONICLE

Time for Montanans to stand up for our Yellowstone

By Rich Hohne Apr 30, 2017

To say the Yellowstone ecosystem is iconic is an understatement. One needs only to travel anywhere around the globe and tell them you live in Bozeman or Livingston, and they likely won't have heard about those places. Tell them it is just outside Yellowstone National Park and their eyes light up.

That wonder was instilled in me over two decades ago, shortly after I relocated to the area. Fishing brought me here, and while the landscape, people, culture and vibrancy are really important to me, fishing is the thing that will keep me here forever. Since the outset, the Yellowstone River has been my favorite river. Twisting its way from Wyoming to North Dakota, it is Montana's river more than any other. From the upper stretches in Yellowstone National Park, to the waters just upstream of Billings, I have fished or floated most of it and even spent three glorious years working as a fishing guide on the Yellowstone.

No matter how many days a year I spend on the river, it is never enough. The Yellowstone River has given so much to me, but also to all of Montana. Now, it's time to return the favor. Senator Jon Tester just yesterday proposed the withdraw of two proposed gold mine permits on land near Yellowstone Park, which should be a step in the right direction. A bill meant to curb the recent threat of mining in some of the most dramatic parts of the river is the right thing for our government to support. Mining in many places of the state can and does drive economic vitality, but in the wrong place could jeopardize the most treasured parts of the treasure state. Join me and the world that loves the Yellowstone River by standing up for this long-time friend.

Rich Hohne, Bozeman

Thanks to Sen. Tester for protecting Yellowstone

By Sabina V. Strauss Apr 29, 2017

I'd like to thank Sen. Jon Tester for introducing the Yellowstone Gateway Protection Act, which will keep big gold mines off our public lands next to Yellowstone National Park.

Our tourism-based businesses here in the Paradise Valley depend on the health of the Yellowstone River and the environment. The river is the lifeline of this valley. Even though I might not have a rafting or fishing company, if something happens to the river I'll lose my business just the same. And if I lose my business, I have to move way, so I lose my home. And I'm not the only one. I'm a proud, active member of the Gardiner Chamber of Commerce, and of the 340-member Yellowstone Gateway Business Coalition, and I can say I'm not the only business owner who doesn't want to risk the health of our river and our economy.

Sabina V. Strauss, Gardiner

BOZEMAN DAILY
CHRONICLE

Tester lauded for standing up for YNP

Apr 28, 2017

Senator Jon Tester spoke to roughly 200 people about the effects of climate change on Montana's agricultural community during an event hosted by Plowing Forward on Friday, Feb. 10 in the community room at the Bozeman Public Library.

Rachel Leathe/Chronicle

Buy Now

Montana Sen. Jon Tester is commended for proposing a permanent ban on new mining claims on public land near Yellowstone National Park. If passed, the measure would prohibit claims on two pieces of Forest Service land in Paradise Valley south of Livingston.

This proposed ban recognizes the special nature of Yellowstone Park and the surrounding region. And it deserves to become law.

The ban would affect plans by the Crevice Mining Group, which already has a claim on public land near Jardine, close to the park's boundary. And Lucky Minerals Inc., is looking for gold deposits on private land near Emigrant Peak. Both would be prevented from expanding their mining plans by the ban.

We all benefit from the fruits of mining. But mining is a messy business. And nobody should know that better than Montanans. We have a history of despoiled land left behind by the mining industry. One need look no further than Butte's Berkeley Pit for evidence.

And there are some places where it is simply inappropriate to leave the permanent scars of hardrock mining and take the risks of wholesale pollution it can cause. Yellowstone is just such a special place. Congress recognized that when they designated it the world's first national park in 1872.

Despite the extensive development of the last century and a half, there are still untapped mineral deposits throughout the West. Unfortunately, the mining industry is still governed by the 1872 Mining Law, which was adopted in an era when the West was viewed as a vast emptiness to be exploited for its riches. And the law provides for little control over this industry. One hundred forty-five years later, we have found new land-use values that prize the land for the recreation opportunities and wildlife habitat it offers.

Congress won't find the political will to update the antiquated mining law any time soon. But Tester's proposal will at least provide some protection for Yellowstone Park and its surrounding area.

To be sure, his proposal faces a tough challenge of getting passed by Congress. Still, we wholeheartedly applaud the effort and wish the senator well in protecting the jewel that is Yellowstone.

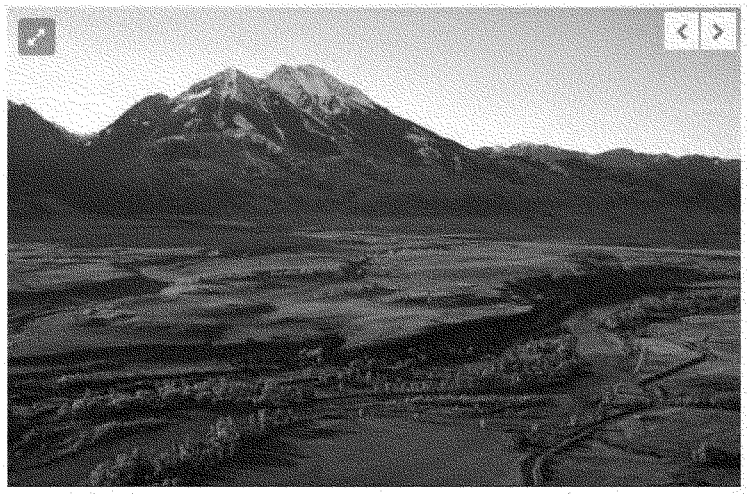
Editorial Board

- **Stephanie Pressly**, publisher
- **Nick Ehli**, managing editor
- **Bill Wilke**, opinion page editor
- **Don Beeman**, community member
- **Richard Broome**, community member
- **Renee Gavin**, community member
- **Sarabeth Rees**, community member
- **David Swingle**, community member

BILLINGS GAZETTE

Tester announces legislation to ban mining near Paradise Valley, Yellowstone National Park

BRETT FRENCH french@billingsgazette.com Apr 25, 2017



Emigrant Peak rises above the Yellowstone River in Paradise Valley. Emigrant Gulch, on the left side of the peak, is one of the areas that had been proposed for mining exploration.

LARRY MAYER, Gazette Staff

BUY NOW

A bill to permanently halt mining on federal land surrounding Montana's Paradise Valley will be introduced to the U.S. Senate this session, Sen. Jon Tester announced Tuesday.

The Yellowstone Gateway Protection Act permanently withdraws federal mineral rights on 30,000 acres of public land in the Custer Gallatin National Forest adjacent to the Absaroka-Beartooth Wilderness and Yellowstone National Park, and it eliminates the ability for proposed mines to expand on to unclaimed public land.

A two-year prohibition on mining on public lands was enacted in November by former Secretary of Interior Sally Jewell. Her decision came after locals and area businesses lobbied against the two gold mining companies that have been seeking state mining permits.

Tester said with more people visiting national parks each year, and the reliance of area businesses on the health of the environment to generate income, the legislation is needed to ensure protection for current and future generations.

The Senator said he had forwarded the information about his proposal to U.S. Sen. Steve Daines, R-Montana, who has never taken a stance on the mining issue.

"If we can talk about this from an economic standpoint I think he'll come along," Tester said.

To that end, Tester stressed Yellowstone National Park visitors spent an average of $196 million in Park County in 2014 that helped create and sustain nearly 3,000 jobs. Statewide the outdoor economy supports 64,000 jobs and generates nearly $6 billion for the economy, he said.

"I grew up fly fishing the Yellowstone and my kids shot their first elk in Paradise Valley," Daines said in an email after being contacted for comment. "We need to protect this Montana treasure while also respecting property rights, and that's what's missing if we want to see this bill signed into law."

The Montana Department of Environment Qualityrecommended in December that Lucky Minerals be given an exploration license to obtain core samples from up to 46 drill holes on private land in the Absaroka Mountains in Park County, about 12 miles southeast of Emigrant. The total project disturbance area would be just less than 5 acres. The company wants to gauge the area's copper, gold, silver and molybdenum deposits.

A second company, Crevice Mining Group, is seeking permission to explore for gold on 14 acres of private property near Jardine, just north of Yellowstone Park. The Crevice project has been on hold since the DEQ issued a letter of deficiency last summer asking for more information on the request to drill.

The fact that the mining companies can still mine private lands does not distract from the legislation, Tester said. Big mining projects would need a lot of land to expand since the private parcels are relatively small and surrounded by federal lands. The legislation will take away the incentive to mine in the region, he added, in effect stopping large mining close to the Paradise Valley.

The proposed legislation drew a flurry of praise from conservation groups and local business owners who had lobbied for federal protection. Colin Davis, owner of Chico Hot Springs Resort — which would have mining traffic through its parking lot if Lucky Minerals moves ahead — thanked Tester for taking action.

"We are so thankful for this move," Davis said, adding that his 170 employees and their families were excited about the announcement.

"We are advocates of property rights," said Tracy Raich, owner of Raich Montana Properties in Livingston. "We are not anti-mining. We understand that there are places to mine, but the doorstep of Yellowstone National Park isn't one of them. The spectacular public lands, agricultural heritage, clean rivers and streams surrounding this area give the region a competitive advantage. The lifeblood of our economy is tied to these high-quality natural resources."

When asked what chance the legislation might have with the Trump administration, Tester said he thought the hurdle would be getting Secretary of Interior Ryan Zinke's approval and possibly the newly appointed Secretary of Agriculture.

"If they support it I think Trump will sign it," Tester said.

As a Montana Congressman, Zinke endorsed a mining ban. The two candidates for his seat, Republican Greg Gianforte and Democrat Rob Quist, have both indicated they oppose mining in the region, as well. Whichever candidate is elected, Tester said he will approach him to carry companion legislation in the U.S. House.

BOZEMAN DAILY
CHRONICLE

Montanans must stand against mines near Yellowstone

By Ryan Smith, guest columnist Apr 8, 2017

My Montana utopia is the Paradise Valley and is where I spend the most time in the backcountry. It is the wild, unadulterated space that keeps me coming back.

Southwest Montana has been my home for two decades. In this time, I have spent nearly every fall pursuing elk in the mountains around Yellowstone Park. Many of my wildest experiences in the woods have occurred in the Paradise Valley – watching an adult grizzly bear bury an elk carcass, seeing a mother bobcat with three large kittens hunt and play right in front of me, having a pack of wolves surround my camp at night and howl from all sides.

That's why I want to keep gold mines out of the Paradise Valley. Did you know that right now, two foreign-owned mining companies are planning risky gold mines bordering Yellowstone National Park? And that one of them, on Crevice Mountain, is less than a half mile from the park boundary?

An Australian-backed company wants to dig on Crevice Mountain, and a Canadian company has staked claims up Emigrant Gulch. These projects threaten our access to our public lands. If either of these projects moves forward, we'll likely see locked gates and no trespassing signs barring public access.

These projects will also tear up good habitat for the elk, deer, bighorn sheep and moose. Elk will especially be in trouble on Crevice Mountain. Yellowstone's biggest elk herd winters along the northern boundary of the park, mostly because there's less snow there compared to deeper in the park. Three quarters of the total elk in the Northern Range – around 5,000 animals – depend on the area north of the park to spend winters and to migrate. Crevice is one of the main highways for animals migrating from the Lamar, and from the Hayden Valley deep in the park. Mule deer and bighorns also migrate across Crevice Mountain.

If you like to fish, hunt, hike, explore, and have wild encounters on our public lands in southwest Montana and north of the park, join our neighbors in closing the door on these potentially disastrous mines.

Join the local business leaders in the Yellowstone Gateway Business Coalition – more than 325 business owners who oppose these risky developments. Joining this group doesn't make you political. This is a bipartisan group that's protecting their businesses, their jobs, and the existing economy of the Paradise Valley and southwest Montana. The

coalition brings together lefties and Libertarians, and has the support of both Interior Secretary Ryan Zinke (our former Republican Montana congressman) and Montana Sen. Jon Tester (D).

Joining the business coalition also makes you the opposite of a tree-hugger that's against every mine everywhere. The coalition is laser focused on saying no to these two risky projects only. They don't oppose Stillwater. Stillwater has offices and employees in Montana, has a firm Good Neighbor Agreement with the locals, and posts its quarterly financials on its website. The two companies behind the Paradise Valley mines can't say the same. And one of those companies, Canada's Lucky Minerals, is proposing to risk our water, our public lands and our way of life for 10 jobs that aren't likely to be filled by anyone local.

So support the Yellowstone Gateway Business Coalition. Let's stand up against these terrible ideas that threaten our elk, mule deer and bighorns, as well as our access to our public lands near the park. Yellowstone is more valuable than gold.

Sign up at dontmineyellowstone.com.

STORIES / MONTANA / KNOW

Author: Nate Schweber, Photographer: Lido Vizzutti, 4 April 2017

It's gorgeous out here, it's perfect," Nate Mildren said at the base of a centuries-old Rocky Mountain white pine thrusting up from the Absaroka Mountains. The slope he stood on, which could have been a set piece on "The Sound of Music," overlooked the pristine 2-million acre expanse of Yellowstone National Park.

It was early October 2016 and Mildren, 45, a real estate specialist, drove 180 miles south from Montana's capital city, Helena, at the behest of a man named Mike Werner. Werner is a miner who wants to explore for gold on the piece of private property we stood on and neighboring national forest land on the border of Yellowstone, a place that in the previous 10 months drew more than 4 million visitors. His plan outraged both tourists and community residents alike. But in Werner's telling, he was the aggrieved party.

"Everyone that's being reactive is being self-centered," Werner said, broadcast onto the mountain slope from his hometown of Spokane, Washington via the FaceTime app on my iPhone.

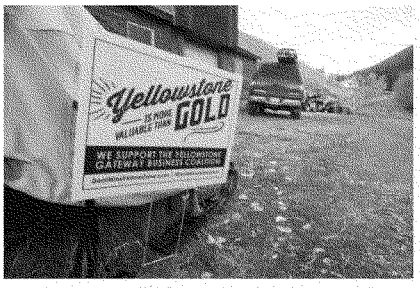
In late November President Barack Obama's Secretary of the Interior, Sally Jewell, announced a temporary mining ban on roughly 30,000 acres of public national forestland around Yellowstone, effectively blocking any new large-scale mines. A hundred people cheered the announcement, made at a ceremony at the base of a mountain gulch that was a site of another new proposed gold mining operation. For more than a year, multitudes of people living below the potential mines had flown yellow signs reading "Yellowstone is More Valuable Than Gold." The signs stretched more than 100 miles from storefronts in the city of Bozeman, through barbed wire cattle fences in the majestic and aptly-named Paradise Valley, all the way to the secluded houses in the mountain village of Jardine, on the edge of Yellowstone, where Werner has his sights set. His mines would bore into the Absaroka Mountains just above where Susan Johnson lives with her family.

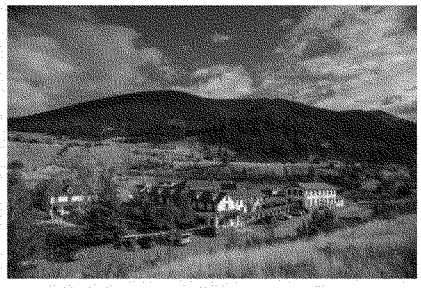
"It would just ruin the ambiance of the whole area, it would be devastating for the elk and grizzly bears, we're totally against it," said Johnson, 59, who co-owns Hell's A-Roarin' Outfitters, a guide service that packs visitors into the wild backcountry on horses.

The fight isn't over. The moratorium lasts only two years. It is scheduled to be reconsidered in 2018 by the administration of Donald J. Trump, a president whose love of gold is as subtle as that of King Louis XIV. Trump's Secretary of the Interior, Ryan Zinke, a Republican and formerly Montana's sole congressman, had criticized the plans to mine near Yellowstone. But he was absent from the ceremony announcing the temporary ban.

The battle over the mines is also set to reignite as the borders of America's national parks turn increasingly into fault lines. Industries that built the old west—logging, gas drilling and mining—are colliding in an increasingly crowded region against new industries such as fly fishing, backpacking and rafting; the ecotourism economy built on the values of scenery, silence, and protection of water and wildlife.

"It's a good microcosm of the sort of west-wide changes in demographics and values happening over the last 20 to 30 years," said Beth Kampschror, spokeswoman for the Greater Yellowstone Coalition, one of several environmental groups opposing the mines.





1. A sign north of Yellowstone National Park. / 2. The owner of Chico Hot Springs Resort and Day Spa is a vocal opponent to one of the proposed sites.

In 2015 Werner submitted his gold exploration applications for Yellowstone country and a British Columbia company called Lucky Minerals did the same. Their claims rested in another part of the Absaroka Mountains just 20 miles north of the park. Speaking by phone from Canada, Shaun Dykes, vice president of Lucky Minerals, also said those opposing the mines were overreacting.

"They should look at it as there's a potential treasure there that can be mined properly and create wealth and jobs for everybody," he said. "Minerals have to come from somewhere."

But community activists countered that the land's lasting value springs from its health and scenery.

"There's so much common sense involved in what a bad idea this is," said Colin Davis, general manager of Chico Hot Springs Resort, which employs 170 people and welcomes guests to bathe in a geothermal pool at the base of the gulch Dykes wants to mine. (The announcement to temporarily ban the mines was made at Chico Hot Springs.)

Much of the concern over the mines stems from the fact they would sit above southeastern Montana's aortic artery: the Yellowstone River. At 692 miles long it is the longest undammed stream in the contiguous U.S. It provides vital water for wildlife, agriculture, and towns in Wyoming, Montana, and North Dakota.

Decades earlier, Absaroka mountain mines became tapped out of all easily accessible gold, plus silver, lead, and arsenic used for agricultural pesticides, historic reports show. Geologists say the only remaining gold in these mountains, which rose as volcanoes some 50 million years ago, would lie deep under their surface. So would iron sulfide. Mixed with rain or snow, iron sulfide becomes sulfuric acid. The toxin now leaks from many of Montana's estimated 20,000 historic mines.

Both Werner and Dykes say all environmental threats could be mitigated with new technology. They imagine any industrial mining would be done underground via surgical-like bores. The surface, save chopping some trees and widening dirt roads, would be left as untouched as possible. Ore would be processed at a remote location, as a courtesy to the community, by having convoys of dump trucks haul millions of tons of extracted rock away via the two-lane highway leading from Yellowstone. River pollution wouldn't be an issue, they said, because of the angles of the mine shafts.

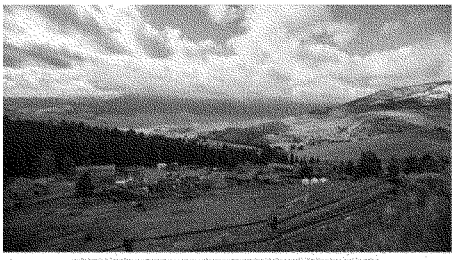
"It's not going to happen because it hasn't happened," Werner said.

He speaks from experience. Werner worked for the last company to mine gold in Jardine. Called TVX Mineral Hill Inc., it closed in 1996. That evidence of some of their and other nearby abandoned mines—rusted strips of rail, sluice ditch gouges, and collapsed entrances—are now regrown with Douglas fir trees, snowberry bushes and wild roses is partially their doing. The federal Bureau of Land Management in 2011 gave TVX an award for outstanding mine cleanup work.

According to the Montana Department of Environmental Quality, however, between 1996 and 1999 TVX was cited three times for environmental violations at the Mineral Hill site. Once for digging an unauthorized pit. Again for allowing too many nitrates into the groundwater. And a third time for piping mine drainage into a creek that pours through the national park and into the Yellowstone River.

"Another threat could throw the balance completely in the wrong direction," said Max Hjortsberg, of the Park County Environmental Council. "It's a very sensitive ecosystem."

Some fear the balance has already tipped. Lower in the Yellowstone River in 2011, and again in 2015, pipelines burst and spilled more than 93,000 combined gallons of crude oil. Then in August 2016, an invasive spore killed an estimated 40,000 mountain whitefish in the Paradise Valley. As an emergency precaution, the state closed 183 miles of the Yellowstone River to all recreation. As the stench of dead fish on valley winds at peak tourist season emphasized the river's fragility, University of Montana economists estimated the cost to businesses in Park County might have topped $500,000.



A tug-of-war between earnest preservationists and wily industrialists has strained Yellowstone country since the 1860s when the first mines were staked on what was legally Crow Indian land. Brawny prospectors and crafty investors were rewarded by the mines, which Gilded Age humorist Mark Twain is said to have defined then as, "a hole in the ground owned by a liar."

Yellowstone was proclaimed the world's first national park in 1872. In the 1890s, outlaws from the rough-hewn mining town of Cooke City, Montana raided across Yellowstone's northeast border and poached all but a known 23 of the last remaining wild buffalo in America. Simultaneously, the town's namesake, financier Jay Cooke, lobbied the U.S. Congress to shrink Yellowstone by one-third so he could build another mining railroad. He almost succeeded.

"Mining had enormous influence here," says park historian, Lee Whittlesey.

Early environmentalist John Muir sounded a different call. In his 1898 Atlantic Magazine article celebrating Yellowstone, Muir also wrote of the Absarokas being, "mountain mansions so rare." In 1903 President Theodore Roosevelt signaled his agreement as he dedicated a stone archway that now bears his name at Yellowstone's northwest entrance. Roosevelt, who protected the national forests around Yellowstone, urged the hundreds of community members who gathered around him at the arch dedication ceremony to forever be, "jealously safeguarding and preserving the scenery."

By the early 1980s, mining was in deep decline across Montana. Taxpayer-subsidized cleanups of abandoned, toxic mines offset the mineral wealth that had been produced—and mostly siphoned to out-of-state executives. "It is a cruel fact that no simple cheap way exists to clean up old mines," environmental historian Jared Diamond wrote in his 2005 book "Collapse: How Societies Choose to Fail or Succeed." In 1983 came the shutdown of the enormous open-pit copper mine 110 miles from Yellowstone in the city of Butte. Those mines once made Montana one of the richest states in the nation. Today they constitute the largest federal toxic superfund site.

Still, the tug-of-war raged. In the late 1980s President Ronald Reagan vetoed a bill that would have stopped new mines around Yellowstone after advisers told him the move could help the Republican Party pick up a Senate seat (Montana's then Democratic senator John Melcher, who supported the mining bans, was defeated in 1988 by Republican Conrad Burns, who didn't.) In the late 1990s, President Bill Clinton used the embattled Land and Water Conservation Fund to retire private claims around Cooke City and clean old mines leaking acid down through the park and into the Yellowstone River. The water cleanup dovetailed with a surge in anglers wanting to fly-fish in pristine waters for trout, as popularized by the 1992 film "A River Runs Through It"—partially filmed near Yellowstone. The number of raft companies plying the cleaner Yellowstone River then doubled, according to data from a local chamber of commerce.

When TVX closed the last industrial mine near Yellowstone after the gold market plunged in 1996, it was a hard economic blow for Park County. Some 120 jobs paying around $60,000 a year vanished, state officials said. But census data shows a striking rebound. As the county population grew by 1,500 over the next 20 years, businesses rose from fewer than 500 to close to 800 and the number of employed adults climbed from less than 7,000 to more than 10,000. Also, average home values more than quadrupled from less than $49,000 to more than $210,000 as the spectacular landscape drew retirees and celebrities. And Per capita income in 2015 had grown to near $26,000; less than the national average of $28,555, but more than double the county's per-capita income when mines were active.

Meanwhile, Yellowstone visitation grew by a million. Now the region reaps an estimated half-billion dollars a year from nature tourism. In 2015 the Kauffman Foundation, which monitors start-up activity in each state,ranked Montana at the top in new business creation. Economists speculated that entrepreneurs were attracted by the awesome outdoors.

"These mines don't match the economic drivers," said Michelle Uberuaga, executive director of the Park County Environmental Council.

At November's mining moratorium announcement Montana's Democratic senator Jon Tester—the only farmer in the U.S. senate—said he would introduce legislation to make it permanent. Though Rep. Zinke was absent, two months later at his congressional confirmation hearings for Secretary of the Interior, he said he was inspired by Theodore Roosevelt. It underscored the value of Yellowstone country as a place pure enough to sustain both endangered grizzly bears and political bipartisanship.

But Dykes and Warner are undaunted. They still intend to explore for gold near Yellowstone on small private lands and claims that fall under state jurisdiction, not federal. The Montana Department of Environmental Quality gave a go-ahead signal to Dykes. He said he expects to drill in the summer of 2017. Twice, however, the state ruled that Werner's applications were deficient. He said he would resubmit.

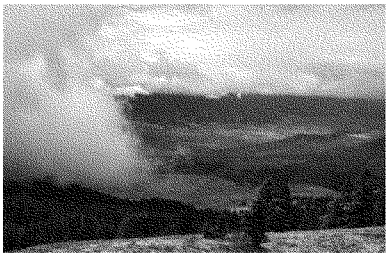
"Exploration doesn't stop until someone gives up," he said. "It'll arise until you and I are long dead."

Of Yellowstone's millions of annual visitors, Werner guessed that "you would probably find only 10 that would ever climb high enough to see what we do."

A popular 2.5-mile trail in northwest Yellowstone rises up slopes speckled with sagebrush tufts where elk herds trot, threads through forests of lodgepole pines that reach into the bracing air, and eventually winds to a panoramic vista at the 8,564-foot summit of Bunsen Peak. Straight south I could see the Grand Tetons 100 miles away. When I looked north just 10 miles away I could see some of Werner's potential gold mine sites.

The 21st century has seen conflict over proposed resort building that would threaten views from Arizona's Grand Canyon National Park, trophy homes that mar the scenery in Utah's Zion National Park, and oil drilling that could sully the environment around Montana's Glacier National Park. This is Yellowstone's battle. Relevant perspective comes from Valerie Naylor, who as superintendent of North Dakota's Theodore Roosevelt National Park worked to save the viewshed from oil companies hydraulic fracturing all around for natural gas.

"It's the role of the public to speak out to save those views," she said. "They're why people come to a national park."



BOZEMAN DAILY
CHRONICLE

Protection of Yellowstone River should be extended

By Mike Garcia Feb 19, 2017

I'd like to offer my congratulations to the group of over 300 local businesses in the Yellowstone Gateway Business Coalition on their effort to defend our iconic Yellowstone River from the risks associated with gold mines.

After decades of owning a largely river-running based business and having a family that travels the world to run rivers, I can say the global significance of the Yellowstone River cannot be overstated. Within the worldwide river and the worldwide park tourist communities, I'm astounded how many people know the coveted reputation of the Yellowstone River.

Paradise Valley and Yellowstone Park are all part of this same reputation and represent a world-class example of what pristine environments are supposed to frame. As an outdoor recreation business owner here in Montana and also in Central and South America, I know risking Yellowstone's pristine waters to foreign or domestic mining interests is absolutely not a risk worth consideration. The scars left in the Paradise Valley and the potential risk of any harm on Yellowstone's doorstep is not something the vast majority of Americans would accept.

I am currently in Chile in largely a national parks region and the mere mention of Yellowstone Park brings gasps from the Chilean people. It was the world's first national park, and the Yellowstone River that flows from that park should never need be endangered within view of the park that shares its name. Right now, the Forest Service needs to hear from you. They want to know that you support this, and they want to hear why. Please visit www.dontmineyellowstone.com to write your comment. Tell the Forest Service an extended time-out on mining with help ensure Montana's iconic Yellowstone River will continue to uphold its world-class reputation.

Mike Garcia

Bozeman

BILLINGS GAZETTE

Guest opinion: Protect Montana's Paradise Valley water

BEN BULIS Feb 18, 2017

Mining exploration has been proposed near Emigrant Peak, shown behind the Yellowstone River in the Paradise Valley of Park County.

Associated Press

It's easy to take for granted what lies in our backyard, year after year. The Yellowstone River has been a part of my life for 25 years now. I've fished it, swam in it, hunted and camped along the banks, and have been blessed to experience its beauty with friends and family.

I'm the president and CEO of the American Fly Fishing Trade Association. Our members across the country depend on us to be the voice that keeps the fly-fishing industry growing sustainably. While we promote the purchase of fly-fishing gear and the work of our member retailers and guides, we know that without clean rivers for trout, salmon, and steelhead, our industry is dead in the water. We work closely with local groups – our neighbors – who protect, enhance and restore fishing waters. I represent the industry nationally, but I live here in Montana where our blue ribbon trout streams remind us of our good fortune.

That's why I support the recent timeout on gold mining on public lands in the Paradise Valley. The Yellowstone River and its blue ribbon trout fishery cannot be jeopardized by ill-planned mining developments nearby. Last summer's devastating whitefish die-off was a painful reminder that this river system is fragile. We must keep the Yellowstone River clean and healthy, producing bugs and trout for generations to come.

Protecting the Yellowstone also protects the backbone of a thriving fishing economy, both in Park County and in Montana as a whole. A whopping 40 percent of all people who came to Montana in 2016 to fish did so in Park County (page 62 in the latest issue of Mountain Outlaw magazine). Fishing in Park County generates $70 million each year. Outdoor recreation in Montana as a whole is a $5.8 billion industry. The whitefish die-off last year prompted Montana to close the Yellowstone for several weeks, costing Park County an estimated $524,000.

In the spirit of AFFTA supporting local groups that protect local waters, I also support the mining timeout because local business leaders asked for it. The Yellowstone Gateway Business Coalition is made up of 300 regional business owners who oppose these risky developments. Fishing and angling companies account for 25 of those businesses, and those at Simms Fishing Products says it's a no-brainer when it comes to protecting the Yellowstone River.

All 300 business owners are united with the same message: Protect our jobs from the devastation any mining accident or pollution could bring to the Paradise Valley and its thriving economy. This group isn't red or blue; it's purple bipartisan. I don't have to tell you how rare this is today. Lefty enviros and staunch local Republicans are nodding in agreement on this issue, as are Rep. Ryan Zinke (R) and Sen. Jon Tester (D). With Rep. Zinke poised to become our next secretary of the Interior, locals in Paradise Valley feel confident their voices will continue to be heard in Washington, D.C..

Now we need to keep this momentum going. Here's what you can do: Go to dontmineyellowstone.com and with two clicks, send a comment to the Forest Service. They need to hear from you. They want to know that you support this, and they want to hear why. Tell them they're doing the right thing.

Let's protect the Yellowstone River and the fly-fishing industry, as well as the 300 area businesses that want to protect jobs from this terrible idea to mine next to Yellowstone. Join me in speaking up for this mining pause supported by Montanans of all political stripes. Tell the Forest Service today: Yellowstone is more valuable than gold.

BOZEMAN DAILY
CHRONICLE

Federal officials hold open house on mineral withdrawal in Livingston

By Michael Wright Chronicle Staff Writer Jan 19, 2017

Dozens visit an open house at the Shane Lalani Center for the Arts in Livingston on a proposed mineral withdrawal in the Paradise Valley.

Michael Wright/Chronicle

Buy Now

LIVINGSTON — Dozens wandered into a building here this week to look at maps and talk to federal officials about a proposed mineral withdrawal in the Paradise Valley, a process in its infancy.

"There will be a whole lot more information on the road ahead," said Mary Erickson, the supervisor of the Custer Gallatin National Forest. "For us as an agency, we're still getting our feet under us on how this process will play out over the next couple of years."

Forest Service and Bureau of Land Management officials talked with locals and environmentalists at the Lalani Center for the Arts on Wednesday about the process. The meeting came about two months after U.S. Secretary of the Interior Sally Jewell traveled to Chico Hot Springs to announce a two-year ban on new mining claims on roughly 30,000 acres of Forest Service land in the mountains east of the Yellowstone River.

The temporary ban covers two areas — one near Emigrant Peak and one near Crevice Mountain close to the border of Yellowstone National Park — where separate mining companies have asked the state of Montana for permission to hunt for gold on private land. Locals and environmentalists have pushed back against the two companies' plans, arguing that mining could harm the region's natural resources and its tourism-based economy.

A mineral withdrawal would ban new mining claims but wouldn't affect any existing patented claims. Both companies looking to mine in the two areas have already staked claims on federal land. A withdrawal wouldn't directly affect their proposals, but it could impact their ability to expand in the future.

The initial two-year ban is meant to give the Forest Service and Bureau of Land Management time to analyze the impact of extending that ban to last as many as 20 years. Over the next two years, the agencies will look at what impact mining could have on the area. Once that work is complete, a package will be submitted to the next interior secretary for a final decision. A decision on extending the ban is expected by November 2018.

Right now, the Forest Service is working on ensuring it has the cash to cover the first steps. Erickson said they expect they will need about $1 million to do all the work over the next two years.

So far, they have been promised $250,000 to get the work started, and she said that money will likely go toward hiring a team to work on a project and putting up a website with information about the proposal. She expects they will have a chance at more money when the agency's fiscal year ends in October.

At the meeting, Scott Haight, the Butte field manager for the BLM, said the environmental analysis would examine what impact likely mine development would have on the two areas. Haight has worked on mineral withdrawals in the past, and he said 30,000 acres is about average for the size of withdrawals, if not on the lower end of the spectrum.

He said the environmental analysis of such a project is somewhat unique, as it asks land managers to look into a "crystal ball" to imagine potential mining impacts and whether those impacts support the idea of preventing mining.

"You're not looking at a proposal to do something," Haight said. "You're looking at a proposal to not do something."

The crowd of more than 40 people included representatives from the environmental groups Park County Environmental Council and the Greater Yellowstone Coalition. Members of the Yellowstone Gateway Business Coalition and people who live near Emigrant were also in attendance.

Sara Mellgren, who lives at the mouth of Emigrant Gulch, said several of her neighbors run rental cabins in the area. She stressed that she isn't against all mining, but she wonders how the activity would affect her neighbors.

"Doing it in the middle of a tourist area does not make sense at all," Mellgren said.

Rich Hohne, the director of product marketing for Simms Fishing Products, was also at the meeting. He said his company supports a mineral withdrawal in the area because of the economic boon of the region's prized fisheries.

"We're all about protecting habitat that's critical for anglers," Rich Hohne said. "Standing up for the Yellowstone River is a no-brainer for us."

The Forest Service is accepting hard-copy public comments on the proposal until Feb. 21. The environmental analysis process will include more opportunities for public comment.

MONTANA STANDARD

Congress should protect Paradise

Susan Johnson Dec 11, 2016 1

I'm writing to say thank you to Sally Jewell and the United States Forest Service for the two-year timeout on gold mining north of Yellowstone Park. Local business owners, including myself, have asked that gold mining on these public lands are off the table, and I'm thankful the D.C. officials listened.

This pause is the only way to protect my business from gold exploration in my backyard, and it would devastate our hunting, fishing and horseback riding. Not to mention what the traffic would take away from our secluded spot in the mountains.

We understand that mining was once the mainstay of the Gardiner economy, but today the story is different. We rely on clean water and wild mountains to sustain us. There is a time and place for mining, but don't believe this area north of Yellowstone and next to the Absaroka Wilderness is the right place.

We hope Rep. Ryan Zinke and Sen. Steve Daines will join Sen. Jon Tester to pass legislation to permanently protect this priceless area from mining. The work has just begun.

-- Susan Johnson, Gardine

BOZEMAN DAILY
CHRONICLE

Why would we ever put Yellowstone at risk?

By Diane Bristol, guest columnist Dec 17, 2016

Like so many of us in the Bozeman area, you probably treasure your memories, stories and photos of wonderful adventures on the Yellowstone River. Any one of us could fill this newspaper with details about our best day on the water.

But my recent memory of the Yellowstone River is not beautiful, calming nor my best day on the water. It was one of the most eerie and uncomfortable experiences I've had and certainly not one that I want to experience again. My husband and I and some friends from Minnesota floated the Yellowstone the Sunday before Fish Wildlife and Parks closed the river to all river use after an unexplained whitefish die-off. Our friends had a great day, but throughout the float, my husband and I were quietly noticing the number of dead whitefish floating down the river. It was, well, weird.

Now imagine if gold mining is allowed just upstream from the Yellowstone River, the extraction begins and something, anything, goes wrong.

This river and the National Park that it flows out of, both named Yellowstone, are so special that we can't take any risks with them. Yellowstone is our backyard, yes. And it provides countless wonderful memories for those of us that enjoy it often and those that make the Yellowstone their vacation destination. The Yellowstone Gateway Business Coalition is a bipartisan group that's asking for a say in the future of Yellowstone's gateway. Its members, 275+ Montana business members strong, include Simms, Angler's West, Bozeman Angler, Chico Hot Springs, Dan Bailey's Fly Shop, Emigrant Creek Cabins, Geyser Whitewater Expeditions, Hells-A-Roarin' Outfitters, Katabatic

Brewing, Printing For Less, Sitka Gear, Vootie Productions, Yellowstone Angler, and the Gardiner Chamber of Commerce.

Let's have a look at what the business coalition is trying to protect. In 2014, Park County saw $196 million in non-resident tourism revenues. Fishing alone brings this county $70 million per year. Outdoor recreation consumer spending generates approximately $5.8 billion annually within our state. Over 64,000 Montana jobs are generated by outdoor recreation (roughly 6,000 jobs are fishing jobs alone), of which at least $1.5 billion in wages and salaries are earned by hardworking Montanans each year. A 2012 report entitled "Sportfishing in America" ascertained that nearly $350 million of retail sales in Montana per year were directly attributable to fishing. While the Yellowstone River represents only a portion of this data, these are real numbers that reflect the impact of the fishing and outdoor industry to our Montana economy.

Meanwhile, the current exploration proposal put forward by Canadian company Lucky Minerals tells us: "During drilling operations, Lucky Minerals would have 10 workers on the St. Julian Claim." (You can see this yourself by going to montana.gov and searching for "Lucky Minerals draft EA" – it's on page 14 of the draft.) We'd be risking our clean water, the Yellowstone River, local agriculture, and our resilient and entrepreneurial economy for possibly 10 jobs? Ten temporary jobs that aren't guaranteed to be filled by any local people.

Because local business owners don't think this project is worth any risk to clean water, the Yellowstone, or the strong local economy, the Yellowstone Gateway Business Coalition earlier this year asked for a two-year timeout on gold mining on public lands next to Yellowstone. Our wish was granted last month. We're thankful. Without this timeout, we'd be at the mercy of our old-school mining laws, which would allow these foreign-backed companies to mine wherever they want, once they get a toehold.

This timeout we worked so hard for is a great first step. Thank you, Sen. Tester and Rep. Zinke for joining us in opposing these mines. I'm looking forward to working with you and with Sen. Daines on a permanent, pro-business solution that will protect our local economy. By working together, we can find a cross-party solution that reflects the bipartisan business group I'm so pleased to be a part. Let's get to work. Please join us at dontmineyellowstone.com and spread the word: Yellowstone is more valuable than gold.

Diane Bristol is the senior director of employee and community engagement at Simms Fishing Products in Bozeman.

BILLINGS GAZETTE

Why Paradise deserves protection

Dec 17, 2016

I am not a big fan of the Obama administration, but I do care about our local economy, and I care about the Paradise Valley. My daughter and son-in-law run a small business in Emigrant. That's why they joined the Yellowstone Gateway Business Coalition. It's not hard to draw the connection between the amazing scenery, world renowned fishing and jobs in Park County. That's why I'm writing to express my gratitude for the recent timeout on gold mining.

My wife and I own a ranch about four miles south of Emigrant, and we are here for one primary reason: the incredible beauty and solitude we experience here. While we realize that there is a heritage of mining and ranching in Montana, we also realize that there are places in the world that are so incredibly special that they should not be disturbed any more than absolutely necessary. Paradise Valley is one of those places.

Many people, like myself, have placed conservation easements on their property so that the integrity of the land will be maintained in perpetuity.

My local business owner friends in the Yellowstone Gateway Business Coalition asked for this timeout, and their voices were heard in Washington, D.C. A Canadian or Australian company should not have the right to override our rights to run our businesses and protect our own property from pollution.

I believe that Sen. Daines, Sen. Tester and Rep. Zinke will stand up for Montanans in Washington, D.C., and carry this to the finish line. Frankly, I also believe the Trump administration will listen to local business concerns.

Bob and Kitzy Parker

Emigrant

BILLINGS GAZETTE

Mining projects were not a good idea in Paradise Valley

Dec 11, 2016

I was quite pleased over action taken to remove public lands near Yellowstone from mining — I'm hoping deeply that the exclusion will be made permanent, with the whole of our congressional delegation on board.

With a background in metallurgical engineering, and a professional career in mining and environmental remediation in Butte, I have lived with the genie that can be loosed from the bottle. These projects at Emigrant Gulch and Crevice Mountain, near Yellowstone, are both non-starters in my view. The geographic location, the fact that the sites have been done to death by exploratory investigations — producing no viable resource, cost-prohibitive mining and a complete lack of a viable metallurgical means to process any ore. The deposits will not sustain the cost of operating them. These proposed mining operations threaten the diverse, viable economy in the Paradise Valley. The risk of environmental catastrophe is grave.

Consider the economic collapse caused by a parasite in the Yellowstone River, then contemplate mine waste hazards impacting the valley in perpetuity. Anybody opposed to big government certainly does not want to go down that road — look at what has happened in Butte and around the state.

My own grandfather spent a hard winter operating a claim out of Jardine in the 1920s. Mining is in my DNA. However, these proposals are what we used to call in the Army, looking out at Czech border guards locked and loaded while our ammo magazines were taped shut: "a problem."

Tom Bowler

Billings

THE LIVINGSTON ENTERPRISE

Locals to thank for mining decision

Published by Enterprise Staff on Wed, 11/25/2015 - 1:14pm

By: Justin Post
Enterprise Managing Editor

By:

Justin Post
Enterprise Managing Editor

If you're looking for someone to thank for Monday's announcement that the Obama administration is putting the brakes on mining near Yellowstone National Park, look no further than Park County.

Local residents made it happen.

A grassroots effort opposed to mining near Yellowstone sprang up in Park County about a year ago, driven by a bipartisan effort to protect the park and surrounding areas.

This local effort exploded like a turkey fryer fire, ultimately spreading to Washington, D.C., where the Obama administration opted to weigh in.

On Monday, U.S. Secretary of the Interior Sally Jewell visited Park County to announce that no new mining claims will be permitted for the next two years on roughly 31,000 acres of public land around Yellowstone.

Jewell, who visited Park County in August as part of the National Park Service centennial celebration, made the announcement at Chico Hot Springs in front of more than 200 people, including Chico owner Colin Davis, who was a key organizer of opposition. Jewell told the crowd that public lands in Emigrant Gulch as well as near the Crevice and Jardine areas northeast of Gardiner will be placed under a "segregation and withdrawal" for the next two years. This will allow, she said, for studies and an extensive environmental analysis, noting concerns for Yellowstone National Park.

The announcement was reported all over the country and many people applauded the decision.

Jewell's visit should give us all hope that our democracy not only works, but that we *do* have an impact on public policy and the future of Park County.

This bipartisan effort wasn't about politics, but about a deep appreciation for our public lands, preserving our landscape, our economy and way of life. And Park County residents didn't hear political-speak from Montana Sen. Jon Tester when they contacted him about the issue. Instead, Tester came to Livingston and looked Park County residents in the eye to say mining has its place in Montana, but not at the doorstep of Yellowstone National Park. Tester agreed that Yellowstone drives our local economy and has important meaning for so many people all over the world.

Tester took that message back to Washington while local residents, businesses and groups such as The Yellowstone Gateway Business Coalition, the Park County Environmental Council and the Greater Yellowstone Coalition, Republicans, Democrats, anglers, hikers and many others stood together to raise alarm and awareness of the possibility of mining in this pristine area of Park County.

And for that we can all give thanks.

BILLINGS GAZETTE

GAZETTE OPINION

Gazette opinion: Protecting Montana's Paradise

Dec 12, 2016

BRETT FRENCH/Gazette Staff

Buy Now

Livingston skier Michelle Uberuaga telemarks down a bowl on the east side of Emigrant Peak last March during a backcountry ski tour. The mountain rises to an elevation of 10,921 feet and has been a target of skiers since at least the 1950s.

As 2016 draws to a close, Paradise Valley has received a two-year federal reprieve from new gold mining, but Montana officials are working on an exploration request that could lead to the drilling of up to 30 test holes 1,200 feet deep into the valley.

Monday was the deadline for public comment on the draft environmental assessment of Lucky Minerals' proposal to explore for gold and other minerals in the Emigrant Gulch area, about halfway between Livingston and Gardiner. As of Monday morning, 252 online comments had been received, plus a small number of email and hard copy comments, according to Kristi Ponozzo, spokeswoman

for the Montana Department of Environmental Quality. She said the agency will spend the next several months considering and responding to those comments as it completes the final EA.

The draft document recommended that Lucky Minerals receive the exploration permit with some requirements to mitigate environmental impacts.

Lucky Minerals is a small Canadian company that trades on the Penny Stock Exchange in Toronto. Its price has fluctuated between 3 cents and 15 cents per share over the past year. Among the public concerns raised with the DEQ is the company's ability to obtain a reclamation bond. The DEQ response was that Lucky Minerals won't be able to get the permit unless it posts the bond the state of Montana requires.

Ponnozo said the amount of bond needed will be calculated using the final EA.

It's important to understand that the EA doesn't include any analysis on the economic viability of a company or a permit request. The DEQ is focused only on the laws protecting Montana land, air and water.

The exploration proposal involves drilling only private land. Lucky Minerals initially sought permission to explore on land in the Custer Gallatin National Forest, but withdrew that part of its proposal.

Business coalition

Alarmed at the prospect of new mining in the Upper Yellowstone River valley, about 180 local businesses formed the Yellowstone Gateway Business Coalition to protect their livelihoods and quality of life. Their worries intensified when a second small company, Crevice Mining, proposed gold mining near Gardiner, virtually on the border of Yellowstone National Park. The Crevice Mining application is pending with the DEQ asking for additional information.

A study by University of Montana economist Larry Swanson confirmed that Park County's thriving economy is based on tourism and agriculture. Unemployment is lower than the state average and income is higher. The fishing industry netted $70 million last year. Nonresident tourists spent $196 million in 2014. The county is home to 564 ranches and farms.

Mining is an important industry, but there are places where other uses — outdoor recreation and agriculture — are more valuable. Last summer, U.S. Sen. Jon Tester and U.S. Rep. Ryan Zinke

agreed that Paradise Valley is one of those rare places that deserves protection from mining development.

Since then, Tester has pressed the U.S. Department of Interior to put a temporary "pause" on any consideration of mining permits on federal land in the valley between Livingston and Yellowstone. Last month, Secretary Sally Jewell did just that, prohibiting mining claims on more than 30,000 acres of federal public land in Park County for two years.

Jewell's decision doesn't bar Lucky Minerals from exploration, if it obtains DEQ permission. But the federal action would prevent development of large-scale mining in the valley. Tester has said he will introduce legislation in the next Congress to make the Paradise Valley ban on mining claims permanent.

Mining Law of 1872

With Donald Trump becoming president, there's uncertainty about protection for Paradise Valley. The order to pause mining claims for two years could be reversed.

This isn't the first time Montanans have seen proposals to mine on Yellowstone's doorstep. The area has historic mine sites, but they are hardly an argument for mining today. Soda Butte Creek in the northeast corner of Yellowstone was polluted for more than a century by old mining runoff and only cleaned up in the past several years.

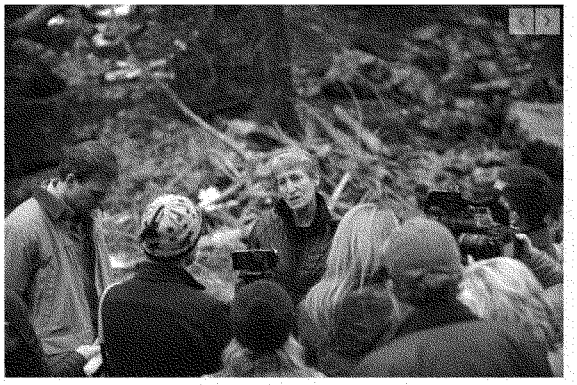
Park County's 21st century economy depends on clean water, clear air, plentiful wildlife and spectacular landscapes that draw people from all over the world to Yellowstone. These natural assets bring artists and entrepreneurs to live in Paradise Valley, making the county a leader in creative businesses.

This outdoor economy and the value it provides to Montanans and our visitors is worth protecting. If Congress and the Trump administration fail to protect Paradise Valley, the antiquated Mining Law of 1872 will determine what happens to Yellowstone's north gateway in 2017.

BOZEMAN DAILY
CHRONICLE

Obama administration blocks new mining claims on 30,000 acres in Paradise Valley

Michael Wright Chronicle Staff Writer Nov 21, 2016



Secretary of the Interior Sally Jewell announced the Obama administration will protect 30,000 acres of land from new mining claims to the media Nov. 21 in Emigrant Gulch.
RACHEL LEATHE/ CHRONICLE

Buy Now

PRAY — The seats were full, and there wasn't much room to stand. About 100 people — locals, environmental groups, political staffers and government officials — stuffed a conference room at Chico Hot Springs here on Monday to hear what they all considered good news.

U.S. Secretary of the Interior Sally Jewell was here to announce that the Obama administration would temporarily block new mining claims on about 30,000 acres of U.S. Forest Service land north of Yellowstone National Park, near where two mining companies have asked the state for permission to look for gold on private land.

"We've all heard what you've told us, which is Yellowstone is more valuable than gold," Jewell said as the room burst into applause.

Jewell made the announcement with U.S. Undersecretary of Agriculture Robert Bonnie, Montana's Democratic U.S. Sen. Jon Tester, Gov. Steve Bullock and Park County Commissioner Steve Caldwell. Joy reverberated through the room. People hugged and cheered, and one man carried a simple sign with a simple message: "Thanks."

"It's just incredibly exciting," said Michelle Uberuaga, the executive director of the Park County Environmental Council.

The move comes more than a year after two separate companies asked the state of Montana for permission to look for gold on private land in the mountains east of U.S. Highway 89. Lucky Minerals Inc., a Canadian company, has applied for an exploration permit near Emigrant Peak, which sits behind Chico Hot Springs. Crevice Mining Group LLC, based in Spokane, Washington, applied to explore for gold near Jardine, just north of the Yellowstone National Park border.

Opposition to the two projects sprang up quickly, including environmental groups, locals and business owners. Earlier this year, the Yellowstone Gateway Business Coalition lobbied for a mineral withdrawal — a request that was fulfilled on Monday.

The prohibition will only prevent new claims on federal land, so it won't directly impact the proposals the two companies have put forward. Both companies have applied to look for gold on solely private land and both have already staked claims on public land that would not be affected.

During the temporary ban, the Department of the Interior will conduct an environmental analysis to determine whether new claims should be suspended for longer through something called an administrative withdrawal. The public will have the chance to comment on that idea until late February, and the U.S. Forest Service will host a public meeting about the proposal in mid-January.

The longest an administrative withdrawal can last is 20 years. Only congressional legislation can withdraw mineral rights permanently. Tester said at the event that he would introduce a bill during the next Congress to do just that.

Sen. Jon Tester spoke Monday after Secretary of the Interior Sally Jewell announced that the Obama administration will protect 30,000 acres of land from new mining claims in Paradise Valley on Nov. 21 at Chico Hot Springs Resort.

RACHEL LEATHE/ CHRONICLE

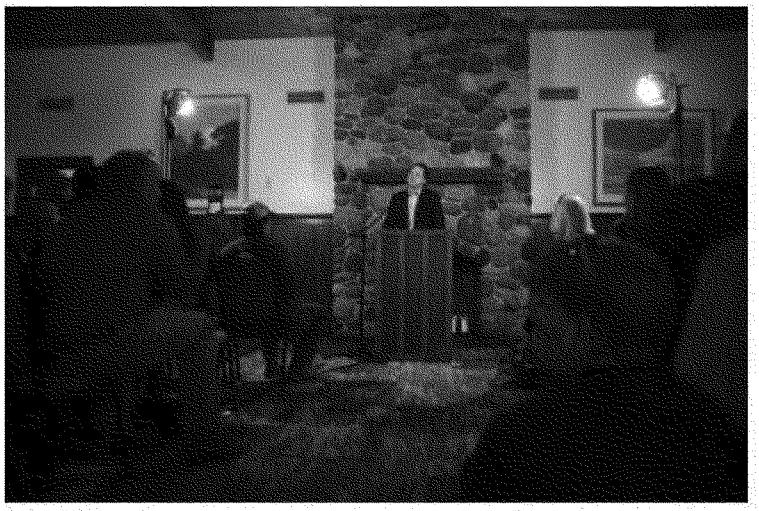
Buy Now

"Responsible mineral development plays an important role in Montana's economy," Tester said. "But there are simply some places where you should not dig and you should not drill, and the front porch of Yellowstone National Park is one of those places."

Earlier on Monday, Jewell and Bonnie joined forest officials for a tour of Emigrant Gulch, where Lucky Minerals has plans to look for gold. A convoy of SUVs crept up the narrow, rocky road that threads the gulch, stopping at a fork in the road. From there, the group hiked a ways in, passing stands of whitebark pine trees, scree fields and Emigrant Creek — which the Forest Service says is sterile because of mining waste from the late 1800s and early 1900s.

"In this area, we don't believe mining is an appropriate use," said Jewell, standing on the road above the creek.

Whether any mining happens there is still in the hands of the state. In his speech Monday, Gov. Bullock described himself as a "strong supporter" of private property rights and said the companies would get a fair shake from the Montana Department of Environmental Quality, which handles mining applications on private land.



Gov. Steve Bullock spoke Monday after Secretary of the Interior Sally Jewell announced that the Obama administration will protect 30,000 acres of land from new mining claims in Paradise Valley on Nov. 21 at Chico Hot Springs Resort.

RACHEL LEATHE/ CHRONICLE

Buy Now

"The state must and will give those companies the fairest application of our state's mining laws," Bullock said.

DEQ is accepting public comment on its draft environmental assessment of Lucky Minerals' plan to look for gold in the gulch. The document says the operation wouldn't have a significant environmental impact and recommends allowing exploration as long as the company agrees to a few conditions.

As for Crevice, DEQ found inconsistencies in the company's application and has asked them to resubmit. Michael Werner, the head of the company, said they plan to do so eventually.

Top officials from both mining companies said they don't expect the ban to significantly affect their operations. Werner said they have already staked the claims they need on federal land and that as long as those remain unaffected, the ban "won't affect us at all."

Shaun Dykes, the vice president of Lucky Minerals, said he was upset the Department of the Interior hadn't consulted with him or the claim owners he is working with before the ban. But, he added, the company has already staked all the federal land claims they want.

"What they've done for me is prevented the competition from coming in for two years," said Shaun Dykes, the vice president of Lucky Minerals.

Opponents of the two mining proposals were cautious to reiterate that the fight over mining in the Paradise Valley is not over. Caroline Byrd, the executive director of the Greater Yellowstone Coalition, said they will watch the proposals on private land closely to ensure DEQ's analyses are thorough.

And, she said, permanent withdrawal through Congress is still the final goal.

"We want to kill it. We want to put a stake in the heart of any mine in Emigrant Gulch or on Crevice," Byrd said.

BOZEMAN DAILY
CHRONICLE

Preserving special places can't be about politics

By Bill Stoddart Dec 7, 2016

The proverb says, "All that glitters is not gold." Last week's victory is a case in point, where at Chico Hot Springs, a two-year timeout was issued on new mining claims and exploration on the doorstep of Yellowstone National Park.

The individuals, businesses, nonprofits, user groups, and elected officials who came together brought a victory home for us all, and should encourage widespread commitment to the enduring value of our outdoor assets, which is far more valuable in the long run than any amount of gold.

Two mining districts on public land in Paradise Valley - one in Emigrant Gulch and one on Crevice Mountain - have been given a two-year moratorium on exploring or developing any new mining claims. While we should celebrate this hiatus, we must also push for permanent protection of these treasured places.

The Yellowstone Gateway Business Coalition and Business for Montana's Outdoors recently hosted an event at the Bozeman Angler. The message? Our landscapes are the lifeblood of our communities and our economies, and we must actively work to protect them.

Threats to our landscapes -- not to mention our water quality -- supersede county lines, community boundaries, and election districts. These lands are shared by all of us who enjoy an outdoor lifestyle as well as by those individuals, families and businesses that generate an enduring livelihood through the land. Conserving these lands is not about politics - it is about a way of life.

Last week's victory should encourage us to unite in support of Sen. Tester's efforts to introduce legislation to permanently protect these lands from industrial development.

We ask you to engage in this effort and we also ask Sen. Daines and Rep. Zinke to support legislation to permanently protect these landscapes to help our communities thrive for the long term. Bill Stoddart, Bozeman

BOZEMAN DAILY
CHRONICLE

Jewell's mining block should be made permanent

By Sabina V. Strauss Nov 30, 2016

This letter is to say thank you to U.S. Secretary of the Interior Sally Jewell for temporarily blocking new mining claims on about 30,000 acres of U.S. Forest Service land north of Yellowstone National Park.

Our small business thrives in Paradise Valley thanks to its pristine environment, and we'd like to keep it that way. We're part of the Yellowstone Gateway Business Coalition, and this as the only way we can protect the living we make from the Yellowstone Basin Inn north of Gardiner.

Last year the park had a record-breaking year, with more than 4 million visitors. Well over half of the park's visitors enter the park through towns in Montana. It's one of Montana's biggest assets and draws. It's the goose that lays our golden eggs. Why are we thinking of gambling with the park or with the Paradise Valley? They give us not just tourist income, but are the backbone of the amenity-based and recreation-based parts of our economy, which weathered the recent recession better than any other sector.

We welcome this week's timeout, but we're not done yet. We need to encourage and work with Sens. Tester and Daines, and with Rep. Zinke on a law that will permanently protect our homes and livelihoods from risky gold exploration and mining. People want to visit here, they want to play here and they want to live here. And not because of heavy industry in our towns or gold mines in our hills. Look outside at our natural beauty and our picture-perfect Yellowstone River. Let's keep these the way they are, and not allow gold mining on our public lands here.

Sabina V. Strauss

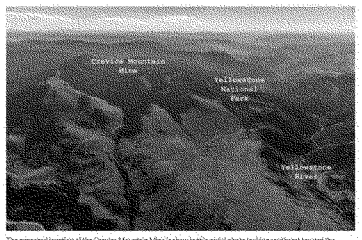
Gardiner

BILLINGS GAZETTE

GUEST OPINION

Guest opinion: Don't mine on Yellowstone's border

STEVEN KOEHLER Nov 9, 2018



The proposed location of the Crevice Mountain Mine is shown in this aerial photo looking southeast toward the Absaroka-Beartooth Wilderness. The mine would be located just outside the northern border of Yellowstone National Park. Decker Flats is in the foreground.

yellowstone.org

On a recent chilly Wednesday, a handful of Gardiner-area business owners, exploration and mining professionals, and representatives from Park County and Yellowstone National Park stood on a snow-dusted trail on Crevice Mountain overlooking Yellowstone National Park. From this vantage point, the Yellowstone River, Blacktail Plateau and Electric Peak are prominent landmarks. If an Australian-backed company is permitted to explore for and eventually mine gold here, this area would soon host waste rock dumps with a footprint the size of nine football fields. This resulting disturbance would be visible from Yellowstone.

I joined the Crevice Mountain site tour because I'm a Gardiner resident and a geologist with more than 25 years of experience managing drill-intensive gold exploration projects for senior producers and junior explorers in Nevada. I've worked on successful teams responsible for 10 gold discoveries, six of which have been developed into profitable mines.

Both this tour and my review of the exploration license application that Crevice Mining Group submitted, have convinced me that the proposed activities at Crevice are flawed on multiple levels.

The proposal is littered with red flags:

- It lacks the necessary scientific data to protect and monitor ground water in the basin and the Yellowstone River drainage.
- It lacks details on impacts to property values of private landowners and the burden carried by Park County taxpayers.
- It doesn't indicate the impacts to local wildlife or the wildlife that migrates through Paradise Valley and the surrounding public lands.

CMG is a small company with no revenue or cash flow and appears to have limited access to capital investment to cover the massive up-front costs (e.g. exploration, land use permitting, groundwater monitoring, investigative mineral processing, etc.) essential to the decision making process of mining. CMG appears to be putting the cart before the horse in this proposal by assuming a profit before completing the hard work of setting up a viable business. The proposal describes the development of an exploration decline for underground access, before learning exactly where the gold is by verifying its location and continuity with surface drilling. CMG calls it exploration; I'd call it mining.

The Montana Department of Environmental Quality, the state agency that reviews and approves exploration and mining activities, identified numerous deficiencies in the Crevice application. I applaud the DEQ staff for due diligence in recognizing the application as substandard.

Modern-day mining companies understand that gold exploration and mining don't belong next to Yellowstone National Park. That's why no major mining company is seriously eyeing this mountain for gold exploration.

Modern exploration and mining companies, that have well-thought-out business plans, understand the need to minimize financial and harmful environmental risk, and that a high level of certainty of mineral existence and fiscal success is required. They also understand that proactively building trust and partnerships with individuals and communities, investing in local infrastructure, and clearly communicating their intentions are essential to building success. They understand certain regions are off-limits to mineral exploration/extraction because of unique landscapes, natural treasures, or because there's potential for massive social opposition. CMG representative Michael Werner doesn't appear to share these modern-day mining values. A presentation by CMG, earlier this year in Gardiner, presented the exact opposite of the values listed above. During that meeting, when asked if he cared that Yellowstone National Park was a neighbor – his response was, "No."

CMG has presented Montana with an exploration proposal that requires more detail and clarification, proposes exploration/mining adjacent to Yellowstone National Park, and is not embraced by the local community. We have a more stable resource than gold – Yellowstone National Park and all the jobs related to the park, the Yellowstone River, and the beauties of the Paradise Valley. Our local economy is vibrant because people visit from all over the world. Let's support the 250-plus local businesses (dontmineyellowstone.com) standing in opposition to the Crevice mine.

BOZEMAN DAILY
CHRONICLE

Mining near Emigrant all risk and no reward

By Kristi Vance Nov 9, 2016

The environmental risks posed by Lucky Minerals proposal to explore for gold in Emigrant are far too grave to allow mining to move forward.

The Montana Department of Environmental Quality (DEQ) concluded earlier this month that there would be no significant impacts from Lucky Mineral's proposal to explore for gold. I have walked through Emigrant Gulch and seen the toxic water that continues to seep to the surface from past mining activities. We learned the hard way this summer how critically intertwined the Park County economy is with clean water after thousands of whitefish died on the Yellowstone River.

The risks posed to not only the environment, but also tourism and agriculture - the economic engines of this part of this state- are significant. The Yellowstone River and the thousands of jobs it supports are more valuable than gold. Any benefits from mining will be experienced by a foreign mining operation with questionable credentials and unclear financial wherewithal. Any missteps will be paid by our local community, for generations to come.

Mining in Emigrant is all risk and no reward. The hundreds of businesses in the Yellowstone Gateway Business Coalition agree. Their businesses and their livelihoods are at stake. DEQ must do its due diligence and prepare an environmental impact statement to fully examine the impacts to our water, our lands and our communities. DEQ has the responsibility of ensuring our constitutional rights to a clean and healthful environment. Please join me in submitting comments by Dec. 12 to DEQ urging them to prepare an environmental impact statement. You can submit comments online at www.luckyminerals.mtdeq.commentinput.com

Kristi Vance

Bozeman

BILLINGS GAZETTE

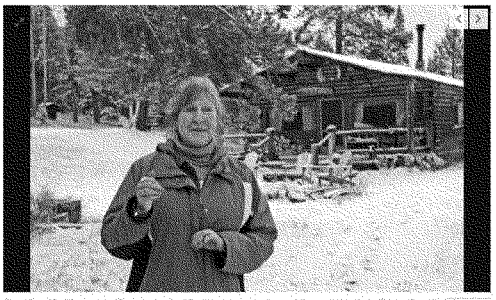
EDITOR'S PICK

MINING IN PARADISE VALLEY

MINING THE MOUNTAINS OF PARADISE

Struggles of the New West coalesce next to Yellowstone

BRETT FRENCH bfrench@billingsgazette.com Oct 9, 2016



Cheryl Standish talks about the effects the proposed Crevice mine near Jardine would have on her business, Crevice Mountain Lodge.

BOB JELLAR/Gazette Staff

BUY NOW

JARDINE — It's an odd twist of fate.

Gold mining founded this town in the 1870s, a mountain community less than three miles from the northern border of Yellowstone National Park and only two miles from the Absaroka-Beartooth Wilderness.

Now a company's proposal to explore an old gold mine near here has residents — some who live on mining claims and are surrounded by the ruins and rubble piles of past extractions — concerned about the future and the environment.

The situation highlights the growing pains of the New West — an old economy of resource extraction versus a cleaner, but often lower-paying, service industry; recreation versus industry; wildlife and the remaining areas of undisturbed habitat versus development.

"Obviously it will hurt my business because people come here for a getaway," said Cheryl Standish, owner of Crevice Mountain Lodge, which borders the proposed mine site.

She's also worried that drilling at the mine could pollute or dry up her well water, as well as create acidic mine runoff into the Yellowstone River that roars past 3,000 feet below the high mountain retreat she's valued for 50 years.

He's a Roarin' Outfitter: Warren Johnson talks about how the mine would affect his business near Jardine.
SGR 2011,LAR,Gazette,Year

BUY NOW

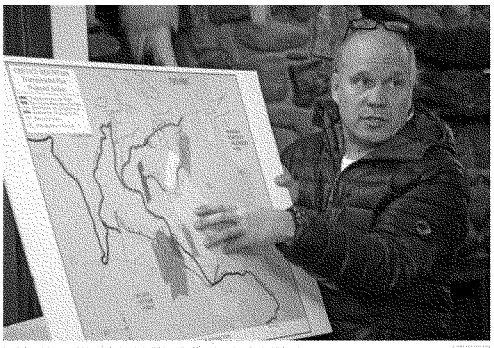
Down the road

Standish's closest neighbor, hunting outfitter Warren Johnson, agrees. For a guy who's spent his lifetime wrestling broncs and the occasional grizzly bear, it's the possibility of mine exploration and the traffic, noise and pollution it might create — along with the effect that might have on his business — that has him worried.

He says trucks hauling mine rock down the road would disrupt the solitude of the business he's built from the ground up — "all by grit" — over the past 34 years with his wife, Susan.

Although Johnson noted the area "has a rich history of mining," he said it also has "a rich history of biodiversity."

His question now is: If the mining proceeds, how might it affect the region's wildlife and scenic values? Are the two even compatible?



The Greater Yellowstone Coalition's Joe Josephson displays the proposed site of the Crevice Mine on Thursday. BUY NOW

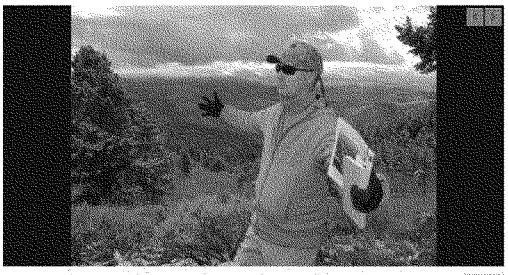
The proposal

Under its plan of operations submitted to the Montana Department of Environmental Quality last October, Crevice Mining Group has proposed "a low-impact program" that would conduct 36,000 feet of continuous exploratory drilling for 18 months.

The work would create 14 acres of new surface disturbance near the old Snowshoe Mine. Nine acres of the site would be set aside for waste rock. "Ditches and runoff control berms upslope from the disturbed area will be constructed to divert surface runoff, and downslope ditches will collect any runoff water from the disturbed area and route it to a sediment collection pond," the application stated.

"This exploration program is intended to determine the continuity of potential ore bodies and attempt to delineate economic ore reserves," Crevice Mining wrote in its application. "If a mineral reserve is identified, and Crevice can justify applying for an operating permit as the project progresses, Crevice may apply for the operating permit."

Under its proposal, Crevice Mining said it would commit $1.1 million to the exploratory drilling. An email sent to Michael Werner, managing partner of Crevice Mining Group LLC, for further comment had not been returned by press time.



BOB ZELLAR,Gazette Staff BUY NOW
Steven Koehler, who works in the mining industry, has few good words for the proposed Crevice Mine near Jardine. Behind Koehler is the Blacktail Plateau in Yellowstone National Park.

Concerned

Marty Malone, who has been a Park County commissioner for eight years, said he hasn't been impressed in his interactions with Werner, which have been all about what the county can do for Crevice Mining.

"It's not the Montana way to go to your neighbor and say we're going to dig a big hole next to you," he said.

Not much is known about the Spokane, Wash., based mining company. The limited liability corporation was formed in January 2015. Werner touts 40 years of international mining experience on the company's website, which lists John Jack Andreazza of Perth, Australia, as the company's other principal.

According to a press release, Bell Copper Corp. hired Andreazza as vice president of metallurgy in 2010. At the time, Werner was listed in the release as CEO and director of Bell Copper.

In a 21-page reply, the DEQ rejected the mining company's original application. Crevice Mining submitted a revised proposal in July. On Sept. 1 the DEQ issued Crevice Mining a "deficiency letter" asking for more information on hydrology and geochemical data.

"They have not responded," according to the agency's Kristi Ponozzo. "There is no statutory time frame for them to get back to DEQ."

Meanwhile, the DEQ is working on the environmental assessment for Lucky Minerals' proposal to drill 46 holes from 23 pads in Emigrant Gulch — another Paradise Valley mining project. Ponozzo said that document could be out for public comment next month.

Critics

The Crevice Mine proposal has drawn criticism from Yellowstone National Park officials, who expressed the park's reservations in a letter during the public comment period.

"We're always concerned about what goes on along our border," said Doug Madsen, of the National Park Service.

At least one mining industry representative, exploration geologist Steve Koehler, has stepped forward, calling Crevice's application to the state lacking in detailed information and said the company's funding is minimal. His wife works for Yellowstone park.

"There's a more stable resource that people from around the planet want to come and see — Yellowstone National Park," Koehler said.

Dave Chambers, a geologist and founder of the Center for Science in Public Participation, also questions the placement of the mine, the amount of gold Werner has said the mine might produce as well as possible problems with groundwater. He noted that previous bankruptcies by other Montana gold mining companies have left the public paying millions of dollars for cleanup costs.

An abandoned mine mill decays on a hillside above Jardine, a relic of the area's gold mining past. MONTZELLAR/Guthrie Staff

BUY NOW

Mining legacy

You don't have to go far from Jardine to see what Chambers is talking about.

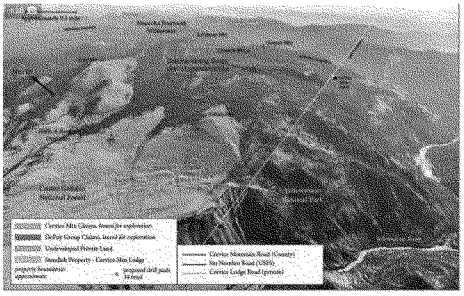
Roughly 35 miles east from Crevice Mountain the DEQ has restored an area outside of Cooke City. There, a mine mill site retired in the 1950s left a legacy of heavy metals runoff, polluting Soda Butte Creek, a tributary to the upper Yellowstone River before it flows through Yellowstone Park.

"The mining industry is being held to a higher standard these days, and with good reason," Koehler said. "With Yellowstone an adjacent neighbor, you have to do better."

After spending $22 million to remove 250,000 cubic yards of mining waste rock, and pumping and treating 100 million gallons of tainted water from beneath the site, the DEQ was recently recognized with a national abandoned mine cleanup award.

Soda Butte Creek — once listed as an impaired waterway because of heavy concentrations of copper, lead and iron — is now meeting federal water quality standards.

"I'm very excited about how the water quality looks," said Tom Henderson, from DEQ's Abandoned Mines section.



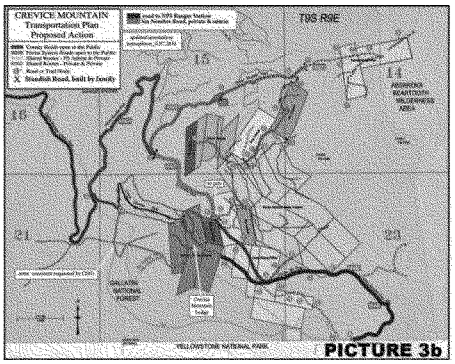
Dodging a bullet

The Cooke City work originated with a unique agreement. In 1996, the Clinton Administration purchased the New World Mining District to avoid mining near Yellowstone National Park.

After the federal government bought the New World Mining District, the Custer Gallatin National Forest spent millions cleaning up the high mountain region at the headwaters of the Stillwater and Clark's Fork of the Yellowstone rivers. Mines in the district had once supplied the McLaren Mill with ore.

Proponents of the restoration work say it helped avoid a disaster like that experienced in Colorado in 2015. That's when an estimated 3 million gallons of toxic mine water escaped from an old adit and tailings pond and polluted the Animas River. The long-term impacts of the spill are still unknown.

The Paradise Valley got a taste of that type of catastrophe this summer when more than 180 miles of the Yellowstone River were closed after a large mountain whitefish die-off. The fish kill was blamed on a new parasite. To keep the parasite from spreading to other waters the state fish and game agency banned all use of the river for weeks, putting businesses that cater to rafters and anglers on their heels — along with all of the subsidiary businesses that benefit from those visitors. The closure that lasted for six weeks on one section of the river was estimated to have cost Park County $360,000.



Rocks

The river shutdown drove home the point that the Yellowstone River and its surrounding environs are the carotid artery of the region, pumping lifeblood not just for grizzly bears, wolves and elk, but also for humans. Intertwined with that need for water there has long been a human penchant for the rocks of the region.

Just 20 miles south of Jardine, in what is now Yellowstone National Park, early Americans were picking up obsidian to create tools and weapons at least 11,000 years ago. Those rocks, coveted for their ability to be worked to a keen sharpness, have been found in archaeological sites as far away as the Mississippi Valley.

Just outside what is now the town of Gardiner those same itinerant hunters would stack rocks and branches in the steep cliffs along the Yellowstone River to herd bighorn sheep to kill sites. Those hunters' abilities would eventually earn them the nickname Sheepeaters, a moniker bestowed upon nearby cliffs.

It wasn't until the 1870s, when gold was discovered in the narrow canyon carved by Bear Creek — where Jardine now lies — that the area would see a completely different and long-lasting fascination with the region's rocks. That attraction lingered until TVX Gold Inc. closed its Mineral Hill Mine in 1996. Werner, of Crevice Mining Group, was chief operating officer for TVX from 1993 to 1995.

Kinross Gold Corp. bought out TVX in 2003, inheriting the Mineral Hill reclamationand closure project.

Based on TVX's exploration, Crevice Mining Group estimates that as much as 1 million ounces of recoverable gold may still be locked in the mountain's rocks.

The stone fireplace in Hell's A Roarin' Outfitters trophy room was made from rocks from places that meant something to Johnson.
BOB ZELLAR/Gazette Staff

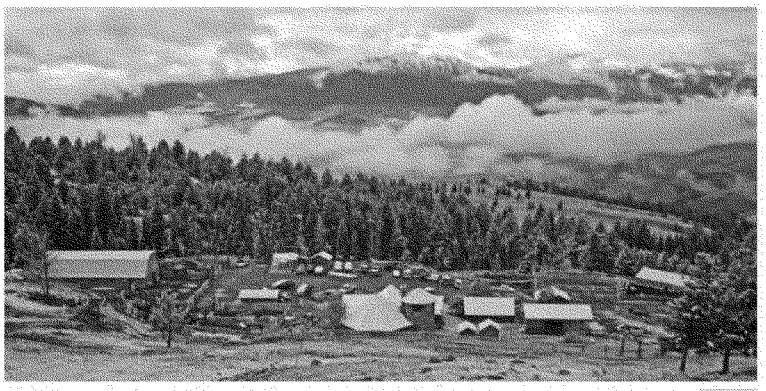
BUY NOW

Chimney rocks

Johnson, too, is a bit infatuated with rocks. His outfitting business and home are on a mountainside with vast views across the Gardiner Basin to the snow-blanketed Gallatin Range.

Enter his residence and the first thing to catch a visitor's eye is a large rock hollowed out to create a kitchen sink. Inside a high-ceilinged trophy room is a dominating rock fireplace that commands attention, with a stuffed mountain lion frozen in midstride near its crest and mountain goats posed on each side of the chimney.

"Every stone that's here, every rock on that fireplace means something," Johnson said, turning to point to the structure for emphasis. "That's where I saw a grizzly bear, or I saw two elk fighting. I gathered them up and threw them in a pile because I knew what I was going to build."



Hell's A Roarin' Outfitters' ranch sits on two old mining claims that overlook the Gardiner Basin and Gallatin Mountains.
BOB ZELLAR/Gazette Staff

BUY NOW

Mining loyalty

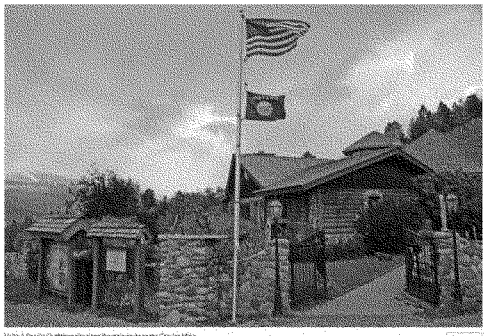
Not everyone sees the mine as a bad neighbor. Montana has embraced its mining history. Emblazoned on the state seal are the words "oro y plata," gold and silver, along with a shovel and pick-axe to memorialize the state's history.

Although few gold mines remain operating in the state, platinum/palladium and coal mining are still sources of employment that provide high wages for employees, even though a graph tracing mining employment has as many peaks and valleys as the state's steepest mountain ranges. Mining employment was at almost 10,000 jobs in 2013. Figures for this year put employment closer to 7,000.

"The county does need jobs," said Malone, the Park County commissioner.

And property taxes, since the state has no sales tax, are failing to generate enough income for places like Park County to continue to fund social services like it has in the past, he noted.

"This year it was really tough to balance the budget," he said. "We had to cut social service budgets by half."



Hatch & Sparkle Outfitters sits along the main route to the Crevice Mine.
BOB UGLAR/Gazette Staff

BUY NOW

Challenger

Bill Berg, a Gardiner businessman who is challenging Malone for his commission seat, said his community near the Crevice Mine is divided over the issue.

"It's dangerous to try and speak for Gardiner," he said. "But land, water and air is our economic base, so this seems ill advised."

The two mines proposed in the valley at least have prompted people to discuss what they want, even if they don't all agree, Berg added.

"Tourism certainly has its impacts, it's not a free ride," he said.

Almost 1 million people pass through Gardiner each year on their way to Yellowstone, Berg said, where last year 4 million people visited. In 2014 the National Park Service estimated that visitors to Yellowstone contributed more than $543 million to communities around the park and accounted for more than 6,600 jobs.

Finding affordable rooms to rent for people who staff the hotels, stores and restaurants that the tourists use is difficult, though, Berg said. So not all is rosy in the tourism economy. Yet he compares Yellowstone and Glacier national parks to the anchor stores of large shopping malls.

"You don't want to do anything to hurt those."

Signs

Bright yellow signs along Gardiner's main thoroughfare read: "Yellowstone is more valuable than gold." More than 100 regional businesses have signed a petition against the Crevice Mine exploration and one proposed in Emigrant Gulch near Chico Hot Springs Resort. To rally support, the Yellowstone Gateway Business Coalition has created a website, dontmineyellowstone.com.

Of the state's three U.S. congressional representatives, Sen. Jon Tester and Rep. Ryan Zinke have taken a stance against the Paradise Valley mines. A spokesperson from Sen. Steve Daines' office said he is still gathering information. Neither gubernatorial candidate has spoken for or against the mines.

Until the next move, residents of the Paradise Valley are in limbo. For some, like Johnson, the unknown is a bit disconcerting.

"I grew up down in Jardine, I was born and raised there, and when I was a little kid I drove above this place and looked down and always wanted to move here," he said. "So I was one of the fortunate people to realize my dream.

"I feel like my greatest accomplishment in life is this place and my kids."

BOZEMAN DAILY
CHRONICLE

Paradise Valley is no place for a gold mine

By Brant Oswald Guest columnist Aug 24, 2016

My name is Brant Oswald, and I am a fly fishing guide and outfitter based in Livingston, Montana. While I am still considered a newcomer to some of the folks around here, I have lived in Livingston and have worked in the local fly fishing business, both as a retail manager and guide, for almost 30 years. Being here isn't an accident — after spending most of my youth on the fly fishing rivers of Idaho and Oregon and northern California, I chose to relocate to one of the true meccas of fly fishing.

My life and my livelihood is based on the fishing opportunities we enjoy here — the Yellowstone River, the Paradise valley spring creeks — Armstrong, Nelson's and DePuy's — and the tributary streams of the Yellowstone, both inside and outside Yellowstone Park. This fishing and its magnificent setting draw anglers to my client list from all over Montana, all over the country, and all over the world.

I'm proud to be part of a local economy that works for many of us. It is partly based on agriculture, partly on tourism and recreation, partly on new higher tech jobs, and partly on the service businesses and professionals that bind the whole thing together. There are a lot of stakeholders in this community, and while we don't always agree on every issue, we work together to be productive in our businesses, but also to protect and preserve a way of life for ourselves and our families.

That way of life and our local economy are important to me. That's why I have joined the Yellowstone Gateway Business Coalition, a pro-business group representing thousands of business owners, their employees and their families in Paradise Valley, Gardiner, and Livingston. We've joined together to protect our economy from two proposed gold mines on the doorstep of Yellowstone National Park.

Right now, foreign mining companies from Australia and Canada are targeting sites in the Paradise Valley to develop large scale mines based on sulfide ores. From their business perspective, they see gold. From our business perspective, we see big risks in gambling on a boom-and-bust industry like gold mining in the Paradise Valley. Our businesses rely on the Yellowstone valley's scenic beauty and wildlife, on its healthy creeks and rivers, and our location as a gateway community to Yellowstone Park.

The Yellowstone Gateway Business Coalition is working to protect our businesses, our community and the long-term health of our economy and way of life. For us, this is more valuable than any gold. That's why we're asking for a time-out on these mines. We've asked our congressional delegation and other federal officials to press the pause button on any mining on public lands on Emigrant Peak and on Crevice Creek near Jardine.

This isn't a political issue for us. This isn't about opposing all business development for the sake of the environment. But we stand at a crossroads. We have the opportunity now to make choices about how economic development will happen in Park County and Paradise Valley. Hitting the pause button now will give us a couple of years to work with our neighbors, our county commission, and other partners and stakeholders to make long-term decisions that will protect our businesses and the outdoor resources that fuel Park County's economy.

If Yellowstone and the Paradise Valley is important to you, the time to act is now. Foreign companies are moving ahead with applications to develop these lands. You can help us make this right. Talk to me or any of the other business owners in the coalition. Join our group at http://dontmineyellowstone.com. We're your neighbors and we'd love to have you. And help us keep our request front and center with officials in Washington, Helena, and in your county and town, to give us time to protect our little piece of paradise.

Brant Oswald is an outfitter who lives in Livingston.

BOZEMAN DAILY
CHRONICLE

Gold mine not worth putting Yellowstone at risk

By Dan Vermillion Aug 17, 2016

I have spent my life fishing and working on the Yellowstone River. It's the longest free-flowing river in the continental U.S. and is home to a remarkably diverse population of fish and wildlife. It's now threatened by an Australian-backed mining company's proposal to explore for gold next to Yellowstone.

Setting aside the environmental threats posed by this mine, this proposed mine doesn't make economic sense. The Yellowstone River is critical to Montana's economy. It is a foundation for Montana's second largest industry, tourism. Its clean water is vital to rural, agricultural communities and towns from Gardiner to Sidney.

Much like Montana, Park County's economy depends upon tourism and agriculture. Both of these industries depend upon clean water for the fish that bring tourists to Park County and the verdant fields that keep Montana famers and ranchers on the land where they have been for generations.

Recent studies have shown that many folks are moving to Park County because of our clean water and healthy environment. These new folks bring investment funds, new ideas, and, in many cases, new jobs. There is no reason to squander the economic advantage provided by the Yellowstone River for a foreign mining company.

Park County's economy is resilient and bounces back from recessions. It is immune to boom-and-bust cycles around oil, gas, and metals. We should not threaten our stable economy for a mine that will be subject to the vagaries of international markets and could pose a threat to our most precious asset, the Yellowstone River. Please ask the Department of Environmental Quality to protect our tourism and agricultural jobs in the Paradise Valley from gold exploration and risky mines. The Yellowstone River and our valley are both more precious than gold.

Dan Vermillion

Livingston

BILLINGS GAZETTE

GUEST OPINION

Guest opinion: Let's protect Paradise Valley's greatest treasures

ANDREW FIELD Aug 6, 2016

LARRY MAYER/Gazette Staff

A family gathers for a wedding below Emigrant Peak at Chico Hot Springs resort last summer.

When I founded the nation's first commercial online printing company in 1996, I did it in Livingston. Few employers in the country can beat the mountain view from our headquarters on the West side of town.

Those mountains, and our surroundings in Livingston and the Paradise Valley, have helped us become what we are today — a $30 million company that's second only to the hospital as Park County's biggest employer. We have more than 200 people doing innovative work, helping customers nationwide achieve their business goals. That's why I'm one of 200-plus business leaders who've

joined the Yellowstone Gateway Business Coalition to protect our jobs from two proposed gold mines in the Paradise Valley.

At PFL, we're focused on building a great place to work in a great place to live. To us that means great neighbors, quiet mountains, clean water, and light traffic. This place allows us to attract and retain talented people with specialized skills. It's much harder to become a press operator, for example, than it is to become a master electrician. Our employees put in their 40 hours here and then they get outside. They hike, they float the Yellowstone, and they enjoy everything we have here in Montana. If we lose the very qualities that make the Paradise Valley special, these skilled workers could find a new job somewhere else and be gone tomorrow — especially with PFL on their resume. What keeps them here is the quality of life.

That's what keeps our company here too. And our contributions to Montana are significant. We pump $10 million in payroll into the local economy every year. This is money we're bringing into the state — 95 percent of our orders come from out of state. And our quality of life is what keeps me and PFL here. I could easily base the company in Denver or Portland or Los Angeles. We're based in Livingston because the clean air, the rural character, the Yellowstone River, and the proximity to Yellowstone National Park all help make PFL a great place to work in a great place to live, allowing us to attract and retain a world-class workforce.

We're not alone. Park County attracts creative workers in an economy increasingly shaped by information and ideas. We're in the top 6 percent of non-metro counties nationwide when it comes to this "creative class" employment, according to an economic study the coalition commissioned this year. We're a fertile setting for entrepreneurs. Nearly 40 percent of all jobs here involve proprietor-owned firms or self-employment.

Our amenities-based economy in Park County is a figurative gold mine. We're risking it if we allow foreign companies to develop literal gold mines up Emigrant Gulch and near Jardine above Gardiner. The Emigrant sites alone involve 2,500 acres of claims staked by a Canadian company. Almost eight Berkeley Pits could fit in a site that big.

The Canadians say these would be underground mines, but that doesn't reassure me or my Business Coalition colleagues — the ore would need to be trucked out somewhere for processing. The company is talking about 25 to 40 semis up and down the Paradise Valley every day. That's ridiculous. Gold mines also threaten our water with acid mine drainage, and all of our businesses here, from agriculture to ziplining, need the Yellowstone River to be clean.

Like Colin Davis at Chico Hot Springs and other members of the coalition, I'm fully in favor of private property rights. And I'm not against mining. But there are simply some places where it just shouldn't happen. That's why we're asking for a time-out on these mines. We've asked the Forest Service to press the pause button on any mining on our public lands up Emigrant and near Gardiner. They can help us protect jobs here in the Paradise Valley. This time-out will give us space to work with our neighbors and other partners to permanently protect our jobs and the public lands that fuel Park County's economy.

The clock is ticking. Companies are planning aggressive exploration right now. You can help us make this right. Talk to any of the business owners in our coalition, learn more at dontmineyellowstone.com. and let your voice be heard. Together we can keep these job-killing mines out of the Paradise Valley.

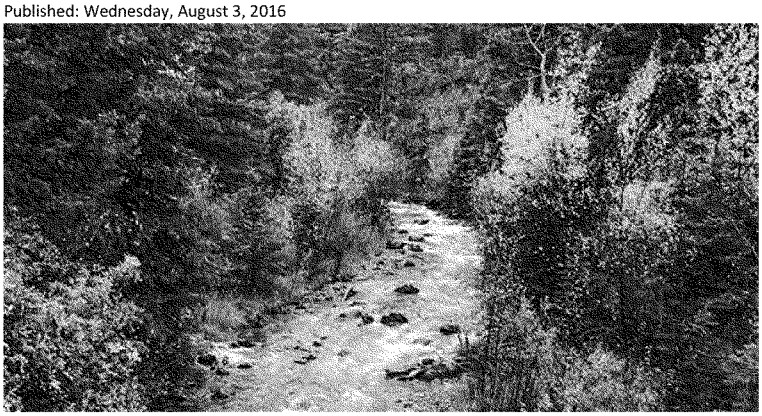
Andrew Field, CEO of PFL, lives in Livingston.

E&E NEWS

YELLOWSTONE: Local group battles 2 mining projects just outside park

Dylan Brown, E&E reporter

Published: Wednesday, August 3, 2016



Emigrant Creek lies downstream from the site of proposed gold exploration near the northern boundary of Yellowstone National Park. Photo by Bryan Wells.

Mining has taken place along Emigrant Creek during the century and a half that Bryan and Sally Wells' family has lived in their pocket of southwestern Montana.

Gold and timber provided the mainstays of life in Paradise Valley when Yellowstone National Park was created just miles south in 1872.

Logging has largely ended, but two companies have submitted plans to resuscitate gold mining in Yellowstone's "gateway."

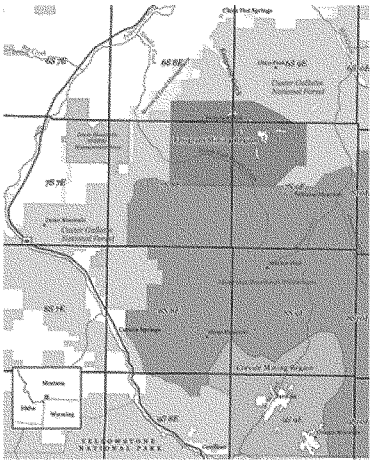
"The difference is now we don't have to take a pick, a shovel and a pan up there, we don't have to go up Emigrant Creek to scratch out a living," said Bryan Wells, whose gray beard fell to the breast pocket of his flannel shirt on a recent trip to Washington, D.C.

Wells, who runs Emigrant Creek Cabins with his wife a mile upstream from the famed Chico Hot Springs Resort and Day Spa, has joined the **Yellowstone Gateway Business Coalition**— local business owners helping lead a charge to block mining.

[+] Map by Charles Wold Drimal, courtesy of Yellowstone Gateway Business Coalition.

Development on the outskirts of national parks across the country has posed a growing concern (*Greenwire*, June 28). But mining proponents cite the legacy of mining in Paradise Valley in advocating what they call a safe, environmentally friendly path forward for exploration on private mineral claims.

"Do the landowners not have a right to undertake bonded exploration activities on their private land to determine the true worth of the property?" asked Michael Werner of Crevice Mining Group LLC, which wants to renew exploration in a former mining district on Yellowstone's border.



But for the gateway coalition, mining represents the past; they see the future as a thriving recreation and tourism economy tied to millions of visitors streaming through Park County to Yellowstone's only year-round entrance.

Not fond of flying, Wells took a nearly 50-hour train ride from Montana to Capitol Hill in May to help the coalition urge the Obama administration to press "pause" on mining. They want the Forest Service and Interior Department to initiate an administrative withdrawal process, allowing two years to complete an National Environmental Policy Act review. After the NEPA review, the agencies could impose a withdrawal for up to 20 years on all claims not currently subject to valid existing rights.

The coalition is working with the National Parks Conservation Association, which has been gathering signatures for a **petition** to send to Interior Secretary Sally Jewell and Agriculture Secretary Tom Vilsack.

"We believe that there are places to mine, and that near the entrance to Yellowstone Park is not one of the places," said Paradise Valley real estate agent Tracy Raich.

'Best use'

The two exploration proposals submitted to the Montana Department of Environmental Quality are separated by only a few dozen miles, but more than an hour drive on U.S. Route 89.

For now, both Canadian company Lucky Minerals Inc. and Spokane, Wash.-based Crevice Mining Group only want to explore mining districts where other companies previously tried their luck on patented — or privately held — mining claims. Dating back to the 1872 General Mining Act itself, privately held claims checker the region, a majority of which is public land.

To encourage settlement in the West, the 1872 law offered mineral rights on public land to citizens for a small, per-acre fee. In 1994, Congress put a moratorium on new patents, but claims such as those in Park County remain in private hands, since mining remains the "best use" of land under the 1872 law.

In its April 2015 **application**, Lucky Minerals proposed exploration in 6 square miles of the Emigrant Mining District. According to the company, drilling in search of gold, copper, silver or molybdenum would take place among 83 historic drill holes in the area unexplored since 1992.

Lucky Minerals had hoped to start two years of seasonal work as early as last summer, but Montana regulators are still reviewing the environmental assessment.

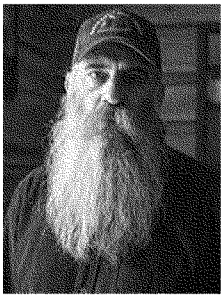
Crevice recently resubmitted its **application** after making small adjustments at the request of the Montana DEQ. While initially hoping to start 18 months of exploration this summer, the company remains stalled on plans to mine near its namesake, Crevice Mountain.

The company's exploration would take place on 14 acres near a historic mine at an elevation over 8,000 feet.

Werner, part of a two-man pair running Crevice, was the chief operating officer of TVX Gold Inc. between 1993 and 1995. TVX operated a mine near Crevice Mountain until 1996.

'Wisest use'

After 43 years of watching mining companies come and go, leaving behind holes and unstable ground, Wells wants to see the old mining areas stay overgrown with plants and trees.



Bryan Wells, owner of Emigrant Creek Cabins. Photo courtesy of Yellowstone Gateway Business Coalition.

"God has reclaimed Emigrant Creek and done a very good job of it," he said. "It would be a shame to see all that tore up."

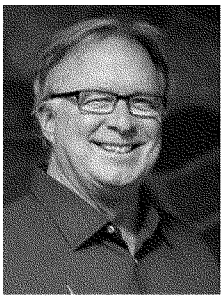
Critics are worried that if either company strikes pay dirt, mining -- with its status as the pre-eminent land use -- will be hard to stop despite required operating permits.

Crevice has said it will seek operation permits if it finds a workable reserve. If Lucky Minerals found gold, it would likely start an open-pit operation.

"It'll be apocalyptic," said Colin Davis, owner of Chico Hot Springs just down the road from the Wellses' cabins. "They're going to destroy this area forever and in such a short amount of time, and then we're left with it forever."

The gateway coalition and the Park County Environmental Council have raised concerns about increased truck traffic on rural roads, as well as exploration adding to Montana's legacy of mine pollution and water contamination.

But Crevice accused the council and other critics of "many inaccurate and misleading statements" about the company's mine proposal.



Colin Davis, owner of Chico Hot Springs Resort. Photo courtesy of Yellowstone Gateway Business Coalition.

"The historic mining, all of which was done before permits, bonding and reclamation, has for the past approximately 100 plus years, not resulted in acid mine drainage and is not discharging to the environment," Werner wrote in a February**open letter**.

Werner argued his company's environmental impact and truck traffic would be minimal, as any potential mine would not be large, producing less than 150 ounces of gold a day.

He also rebuked critics for portraying his mining group as a large, impersonal corporation, noting his wife is from Montana.

"It is unfair to say that this is all about outsiders coming in to make money and pollute the land," he said. "This is about landowners who recognize that the opportunity to profit from their land holdings is best served by having professionals undertake exploration and possible mining activities."

The gateway coalition argues it isn't anti-mining or anti-property rights, but is concerned about mining infringing on their property rights.

Raich, the Paradise Valley real estate agent, whose husband works in the mining industry, said some staunch conservatives such as the region's ranchers oppose mining there.

"We're not just a bunch of crazy tree-huggers," she said. "We're serious about protecting our way of life and protecting Yellowstone."

Tracy Raich, owner of Raich Montana Properties LLC. Photo courtesy of Yellowstone Gateway Business Coalition.

The park's clout in D.C. will help, as will its many advocates, said Davis, the resort owner.

"One asset America has that's iconic in the world, it's really Yellowstone National Park," he said. "It's silly to poke the dragon."

With unemployment below the national average, a reportcommissioned by the coalition found lodging, food service and retail sustained by tourism were the biggest employers in Park County.

"The wisest use is how it's being used right now, attracting people to the area that can really enjoy it," he said. "It's producing."

The report found that fishing alone generated $70 million annually and that second-home buying is booming as the wealthy are attracted to the quiet quality of life.

"They won't come if this is a Superfund site," Davis said.

Montana solution?

In May, coalition members made their case for a mining withdrawal with all three members of Montana's congressional delegation at their D.C. offices.

"We're looking for a Montana solution to a Montana problem," Davis said.

Sen. Jon Tester -- often a moderate Democrat, especially on natural resource issues -- said he is ready to do "whatever it takes" to halt mining, including supporting withdrawal legislation.

"I mean, this is right at the edge of Yellowstone Park, it would have devastating impacts on the recreation economy there, devastating," he said. "So I'm all opposed to it."

Republican Sen. Steve Daines, who hails from nearby Bozeman, Mont., said he is spending a good chunk of his August recess just miles from the potential drill sites "chasing golden trout and cutthroats."

Daines is taking a measured approach to mining.

"Clearly, I have concerns about a large mining operation right there in the backyard of Yellowstone National Park," he said. "There'll be a process to address those concerns and those issues."

Daines, who had his senior prom dinner at Chico Hot Springs, said he wants a "fair, open and transparent" NEPA process that respects property rights, as well.

"I think we'll come to a resolution here that will be beneficial to all," he said. "But it's going to be a long road."

Freshman GOP Rep. Ryan Zinke also believes NEPA is "absolutely fair and thorough," despite numerous "painful" experiences with environmental analysis as a former Navy SEAL commander (*Greenwire*, July 19).

Ultimately, Zinke doesn't see a path forward for mining so close to as sensitive an area as Yellowstone. He also questioned the legitimacy of the mining claims.

"I'd be looking at it from a business standpoint. Do you think someone would ask for an investment over a gold mine next to Yellowstone?" he said. "I find the investment scheme to be — I'm not sure it's a legitimate investment."

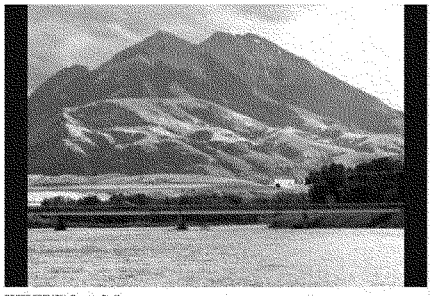
Reporter Colby Bermel contributed.

BILLINGS GAZETTE

Gazette opinion

Gazette opinion: Protect Park County's outdoor assets

Jul 25, 2016



BRETT FRENCH, Gazette Staff

Emigrant Peak towers 6,000 feet above Paradise Valley and the Yellowstone River. A Canadian company is proposing to drill at several sites near Emigrant Peak and Chico.

Park County's thriving economy is rooted in spectacular landscapes — the cold, clear river that tumbles out of Yellowstone National Park through a whitewater canyon and irrigated valley framed by the Absaroka and Gallatin mountains.

Nonresident tourists spent $196 million in the county in 2014.

The fishing industry alone netted $70 million in direct spending.

Gross receipts were $30 million from livestock sales and $15 million from crops among the county's 564 farms and ranches.

Unemployment runs less than the state average and has been trending lower while personal income is above average.

The county ranks in the top 6 percent of non-metro counties nationally for its percentage of creative entrepreneurs. Proprietors and self-employed folks account for 39 percent of all jobs in Park County.

These statistics are presented in a report prepared recently by economist Larry Swanson of the O'Connor Center for the Rocky Mountain West at the University of Montana. The Yellowstone Gateway Coalition commissioned Swanson's study because potential threats to their growing outdoors economy. The coalition members are hundreds of businesses whose livelihoods depend on the natural attractions that draw hunters, anglers, hikers and tourists. These business depend on keeping tranquil places intact.^p

Trouble in Paradise

A Canadian company interested in gold mining is seeking a permit to drill 46 exploratory holes in private tracts at Emigrant Gulch near Chico Hot Springs. Other investors are seeking a permit to explore for gold less than a mile from Yellowstone Park's border near Gardiner.

"My main concern is that it (mining) would destroy my business and my neighbors' businesses," Bryan Wells told Gazette Outdoor Editor Brett French. Wells, 61, rents out vacation cabins in Emigrant Gulch, where he has lived for 43 years and raised a family.

Swanson's study validated Wells' concern, concluding: "The chief threat to area quality of life and economic well-being would be any large-scale activities that negatively impact area amenities and environmental attributes that are the foundation of the area's economic vitality."

In short, the strong outdoor economy of this spectacular Yellowstone gateway is far more precious than the limited, short-term profits of gold mining. Mining brings with it traffic on rural roads and road building on public land. Extracting diffuse gold from large amounts of earth creates large open pits or deep mines that bring acidic ore to the surface.

Business coalition

The Yellowstone Gateway Business Coalition asked the Montana congressional delegation to help pass legislation to put public lands in the valley permanently off limits to mining. Rep. Ryan Zinke and Sen. Jon Tester have agreed that this place deserves protection.

"I strongly support private property rights and responsible mineral development but Montana is the Last Best Place for a reason," Zinke said. "There are some places that are great to mine and other places that are just too precious."

"There are just some places that are too special to dig or drill, and the front porch of Yellowstone Park is one of those places," Tester said. "The effort protecting the Paradise Valley is led by the local community and I am proud to join

these business owners, families, and land owners who have come together to preserve one of America's most unique landscapes."

A spokeswoman for Daines told The Gazette that the senator will continue to listen to and work with the local community.

The Yellowstone Gateway Business Coalition wants a deal along the lines of the North Fork Watershed agreement that permanently protected certain public lands on the west side of Glacier National Park.

Now is the time to protect the outdoor assets that make Yellowstone's north gateway a great place to live, work and grow diverse businesses. Tester and Zinke have recognized the intrinsic and economic values in this public land. Daines should join them; it will take a united delegation to move a protective bill through Congress.

Last month, the Yellowstone Gateway Business Coalition asked the U.S. Forest Service to administratively withdraw 34,000 acres of forest land in Park County from mineral development. Such a temporary withdrawal would give Congress time to work on a permanent protection in law.

The prospect of new gold mining in Paradise Valley demands protective action, because the long-antiquated Mining Law of 1872 is still the law. If the Forest Service and Congress don't act, a law written 144 years ago to promote mining may harm Yellowstone's northern gateway economy forever.

THE LIVINGSTON
ENTERPRISE

Rep. Zinke sides with opponents of mining near park

Published by Enterprise Staff on Fri, 07/01/2016 - 1:36pm

Rep. Ryan Zinke talks with reporters at The Livingston Enterprise, Wednesday. (Enterprise photo by Hunter D'Antuono)

By:
Liz Kearney
Enterprise Staff Writer

Montana's lone U.S. Congressman sides with Democratic Sen. Jon Tester in opposing mining in Paradise Valley and near Yellowstone National Park.

During a Wednesday meeting in Livingston with The Enterprise's editorial staff, Republican Rep. Ryan Zinke said there are good places to mine — "Have you ever been to Decker?" he asked — but not next to national parks.
"There's places to mine. I just can't see where mining around Yellowstone National Park or Glacier meets the greater good," Zinke said.

A Canadian company, Lucky Minerals, wants to explore for gold and other minerals in Emigrant Gulch above Chico Hot Springs. The company withdrew its application to explore on public lands after the U.S. Forest Service said it would require an environmental assessment before the project would be approved. Lucky Minerals then focused its application solely on private land in the gulch and on the flanks of Emigrant Peak, which is subject to a Montana Department of Environmental Quality review.

A second company, Crevice Mining Group, proposes to mine for gold in the national forest and private lands above the town of Jardine.

Zinke expressed doubts about the likelihood of either project moving forward.

"I don't foresee — next to Paradise Valley, next to Yellowstone Park, how they can put together an application that will meet the NEPA process," Zinke, said, referring to the National Environmental Policy Act.

A locally formed group of business owners, the Yellowstone Gateway Business Coalition, opposes both the Crevice Mining Group's and the Lucky Minerals' proposals. The region's pristine air and water and scenic beauty are critical to Park County's economy, the group says, and mining and other industrial activities put the environment at risk.
On Wednesday, a flyover of the Emigrant Peak area was provided to area journalists by the Yellowstone Gateway Business Coalition and Ecoflight, a nonprofit that provides aerial flights over wild lands at risk.

Karrie Kahl, a Chico Hot Springs Resort manager, was on the flight to provide orientation to the site. The five-seater plane flew up Emigrant Gulch and over the top of Emigrant Peak for a view of the proposed mining area. The green-roofed Chico resort was clearly visible as pilot Bruce Gordon headed up the gulch at an altitude of about 10,000 feet.

Colin Davis, the owner of Chico Hot Springs Resort, has been especially outspoken against the Lucky Minerals proposal, concerned about the potential threat to both the resort's cold and hot water sources.

He said Friday he was encouraged by Zinke's comments about the area's unsuitability for mining.

"But the process is arduous," Davis said, referring to the mining application and NEPA. "And it doesn't always take into consideration common sense. But I think if there's a state in the Union where our three congressman can reach across the aisle and vote the will of its citizens, this is that state."

Tester said during a trip to Livingston in October that mining in Emigrant Gulch "is absolutely inappropriate."

The DEQ is currently working on a Lucky Minerals proposal draft EA, which the agency expects to release for public review sometime this summer, according to a DEQ email update.

THE LIVINGSTON ENTERPRISE

We can't keep doing this

Published by Enterprise Staff on Thu, 07/07/2016 - 3:19pm

These things keep popping up one after another.

A mining proposal for the flanks of Emigrant Peak. A mining proposal for Jardine. A gravel pit/asphalt plant proposal south of Emigrant.

Two of these operations would be in Paradise Valley, one of the most beautiful spots on earth.

As they pop up, people opposed try to shoot them down.

There are so many proposals now, it's hard to keep up with them.

To use a metaphor from Livingston's past, this is no way to run a railroad.

What's being played out in these proposals and the opposition to them is the decades-long Montana conflict: on one side, landowners who say, "You can't tell me what to do with my property"; on the other side, residents who reply, "Not if it's going to ruin what makes this place so special and affect the value of *my* property."

There are so many reasons not to have mining, gravel pit and asphalt plant operations smack in middle of the Paradise Valley that it makes your eyes water. No one is saying we shouldn't have them. It's just that having them in a place like Paradise Valley is a bad, shortsighted idea.

To quote U.S. House Rep. Ryan Zinke, R-Mont., in a recent interview with The Enterprise: "There's places to mine. I just can't see where mining around Yellowstone National Park or Glacier meets the greater good."

If we don't come up with a plan bigger than these individual projects, these kind of proposals will keep coming up, roiling the community every time.

That community needs to decide what it wants for Paradise Valley, and other areas like it in Park County. We can't keep repeating these conflicts.

That raises the prospect of the "Z" word — zoning. Few want hard-core, tree-hugging, California-style restrictions. But surely, given the threats to an area cherished by everyone — traditionalists and environmentalists alike — zoning could be crafted that at least rules out large-scale mining and heavy industry.

It would spare us a lot of angst in the long run.

— Dwight Harriman
Enterprise News Editor

BOZEMAN DAILY
CHRONICLE

Company asked to resubmit mining application on Yellowstone border

By Michael Wright Chronicle Staff Writer Apr 12, 2016 0

State environmental officials have stopped analyzing a Spokane-based mining company's bid to look for gold near the border of Yellowstone National Park and have asked the company to resubmit its exploration application, saying the document didn't include all the work the company planned to do.

The Montana Department of Environmental Quality sent a letter to Crevice Mining Group on Monday that lined out several areas where the company's plan to combine an application for mineral exploration with a small miner's exclusion statement — an exemption from permitting for small mines — might break the law because the small miner's exclusion would lead to exploration work beyond what had been included in the other application.

"We came to the conclusion that they were really trying to cover additional exploration work with their small miner exclusion statement," said Edward Hayes, a DEQ attorney.

The state said it is suspending environmental review of the project until the company files an amended application that includes the additional work that the company wanted to do under the small miner's exclusion.

Michael Werner, the head of Crevice Mining Group, said that he'd rather not have gotten the letter, but that it doesn't upset him or raise concerns about the future of the project.

"The reality is you have to follow Montana law," Werner said.

Werner said he would be evaluating whether he agrees with claims DEQ made in the letter or if he still believes his applications were completely legal. He declined to say whether or when the company would resubmit the permit, saying that he needed more time to examine the letter.

"At this point, we're not really sure of what they're saying," said Werner, adding that some of the claims "probably aren't accurate," though he wasn't specific.

DEQ said they are open to conversations with him, but that they are confident in the decision.

"We'll listen to him, but I think at this point we've come to the conclusions set forth in the letter," Hayes said.

In September 2015, Crevice Mining Group filed for a small miner's exclusion statement on Crevice Mountain near Jardine, a town just north of the Yellowstone National Park border. A small miner's exclusion statement exempts hard rock mines with fewer than 5 acres of surface disturbance from the permitting process larger mines must go through.

In October 2015, the company filed an application for exploration in the same area. Exploration is one of the first steps in developing a large scale mine and it requires the regular permitting process, including public comment periods and environmental analysis by DEQ. A public comment period on the proposal ended in early March, and DEQ had begun work on the environmental review.

The company planned to combine the two permits, which is what raised concerns for DEQ. Ponozzo said the department had been concerned about that for some time

"This is something that we have identified as a concern for quite some time," Ponozzo said.

DEQ's letter cited issues like how much surface disturbance was included in the application and the potential for some mining activity to go without a reclamation bond.

In the letter, DEQ said the company planned to build a mining decline under the small miner's exclusion that would also be used in exploration. While the company's application says there would be separate declines, DEQ's letter says the one used for exploration would be an extension of the one built under the small miner's exclusion. Because it would be connected, DEQ argued, it should be included in the exploration application.

Hayes said that was just one way that the two were linked that wasn't included in the exploration application, adding that there were also a hard rock waste dump and and facilities that appeared to be serving both projects.

"You can see it's really one operation," Hayes said.

The DEQ's letter also argued that if the exploration activity found something worth mining, surface disturbance would exceed what's allowed under a small miner's exclusion.

Crevice's small miner's exclusion included 4.9 acres of disturbance. If the exploration activity were added, that number would balloon to 19.4 acres of disturbance because of portions of exploration that DEQ said would be required for mining.

Reclamation bonding was another issue discussed in the letter. Exploration projects require a bond for recovering the area disturbed, while small miner's exclusion projects — unless they are placer mines — do not. If the two projects were combined, it would leave part of the operation without bonding.

Ponozzo said that the letter doesn't mean the project won't go forward, just that Crevice needs to fix the problems in the application.

"It's not a 'no you can't ever do this,'" Ponozzo said. "It's a 'we need you to propose it in the correct manner.'"

Hayes added that he doesn't think Werner intentionally flouted the law.

"I think it might be more of a misunderstanding," Hayes said.

The proposal riled local residents, environmental and business groups. DEQ received more than 200 comments on the proposal, and an online petition against the project garnered more than 73,000 signatures.

Barbara Shesky, the executive director of the Gardiner Chamber of Commerce said in a statement that she was happy with the DEQ's decision to send the application back to the company, and appreciates that they are analyzing the application closely.

"A mine at the edge of Yellowstone National Park demands the highest level of scrutiny," Shesky said.

Jardine has been the site of mining in the past. TVX Gold Inc. ran a mine on Mineral Hill there in the 1990s. It closed in 1996. Michael Werner is a former TVX executive.

Michael Wright can be reached at mwright@dailychronicle.com or at 582-2638. Follow him on Twitter @mj_wright1.

THE LIVINGSTON ENTERPRISE

Friday, March 25, 2016 * Livingston, Montana * Vol. 107 No. 120

Business owners form new group opposing mining near Yellowstone

By Liz Kearney
Enterprise Staff Writer

With a motto of "Yellowstone is more precious than gold," area business owners gathered in Livingston Thursday to celebrate the launch of a new organization, the Yellowstone Gateway Business Coalition.

More than 100 businesses and landowners from Livingston, Gardiner and Paradise Valley who oppose sulfide-ore gold mining operations in Park County have signed on, according to a news release from event organizer Marne Hayes. A launch event was held at Katabatic Brewing on West Park Street at noon.

"Group members are joining forces to oppose the controversial plans for gold mining, which threatens clean water, tourism business development and world-class scenery," the news release said.

Business owners spoke at the gathering about why they joined the organization. Dale Sexton, who owns the Timber Trails outdoor store on West Park Street, said he wants to make sure the surrounding outdoor recreation areas remain pristine for his children.

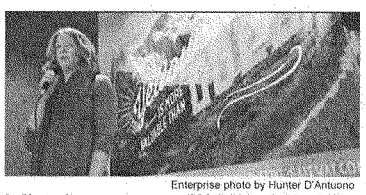
"I feel it is paramount to me to make sure they can, perhaps in another 20 or 30 years, have the same experiences I had in the mountains 15 years ago," Sexton told the crowd.

Sen. Jon Tester representative Jennifer Madgic also addressed the standing-room-only crowd at Katabatic Thursday, sharing remarks on behalf of the senator.

The YGBC formed in response to two gold mining proposals. One came from a Canadian mining exploration company, Lucky Minerals, which proposed exploratory drilling for gold and other precious minerals up Emigrant Gulch on both private and public lands. When Custer Gallatin National Forest officials announced this fall they would require an environmental assessment of the public lands portion of the proposal, Lucky Minerals withdrew its application, saying it would instead focus only on its private lands.

The work on private lands is subject to review by the Montana Department of Environmental Quality.

The second mining operation is proposed northeast of Gardiner by the Crevice Mining Group, which will explore for gold. Some of the area's largest employers have joined the coalition, including Chico Hot Springs Resort, Printing For Less, and Xanterra Parks & Resorts.



Enterprise photo by Hunter D'Antuono

LaNette Jones, co-owner of Livingston's Katabatic Brewing Company, speaks at the "Yellowstone is More Valuable Than Gold" event Thursday.

THE LIVINGSTON ENTERPRISE

Tuesday, March 1, 2016 * Livingston, Montana * Vol. 107 No. 102

Park County criticizes Crevice mine project in Jardine, DEQ takes comments

By Samantha Hill
Enterprise Staff Writer

The Park County Commission approved a letter Tuesday outlining the possible negative impacts of a proposed mine on Crevice Mountain Road in Jardine.

Commissioner Steve Caldwell submitted the letter, to be sent to the Montana Department of Environmental Quality before a comment period ends on March 10.

Crevice Mining Group, LLC has submitted an application to DEQ for exploration of gold mining operations in a 7-acre area, northeast of Jardine, off of Crevice Mountain Road and 5 miles north of Gardiner.

DEQ is accepting comments on the scope of an Environmental Analysis conducted for the possible mine, including accepting recommendations for further environmental studies.

Issues with the mine presented in the letter covered, among other things, increased infrastructure, including upkeep of bridges and roads in the area and other safety concerns.

"Public health and safety elements of potential concern to the Commission include the effects of increased traffic in the vicinity of exploration operations and associated risks to public safety," the letter stated.

Commissioner Marty Malone told the commission he agreed with the letter but thought there was a better way for the commission to decide on submission of future letters on behalf of the full commission. Malone cited previous letters, including ones he had submitted about bison and elk issues that he said did not make it to commission agendas.

However, Commission Chairman Clint Tinsley said the commission has reviewed many letters in the past but commissioners need letters approved by the county attorney before moving forward with them, which Caldwell did with the Crevice Mining letter.

Tinsley and Caldwell voted for signing the letter at the meeting. Malone voted no.

DEQ Coordinator Jen Lane said when the comment period ends next week, the department will determine the next step.

THE LIVINGSTON ENTERPRISE

Monday, November 9, 2015 * Livingston, Montana * Vol. 106 No. 25

Comments on Emigrant drilling plan made public

By Liz Kearney
Enterprise Staff Writer

The public comments submitted to the Custer Gallatin National Forest about a proposed mineral exploration around Emigrant Peak have been digitized and made available online.

The total number of comments on the Canadian mining exploration company Lucky Minerals' proposal to dig exploratory bore holes on public and private land in Emigrant Gulch numbered 5,085, Mark Slacks, a Billings-based forest planner with Custer Gallatin National Forest, said Friday.

Interested members of the public submitted letters during a mandated public comment period after Lucky Minerals filed a plan of operations for proposed exploratory drilling on national forest system lands. The plan was released in June, with comments initially due by July 15. Officials later extended the comment period to Aug. 20.

Lucky Minerals is seeking a "categorical exclusion" under the National Environmental Protection Act. A categorical exclusion, according to a NEPA definition, is a collection of actions that do not have a significant effect on the human environment. Categorical exclusions are allowed unless there are "extraordinary circumstances."

Opponents of the proposal, including local and regional conservation groups, believe the Emigrant Peak area's pristine environment, clean water and endangered grizzly bear habitat all constitute "extraordinary circumstances," and that a categorical exclusion should not be issued.

Slacks said the public comment period is not a vote, but a chance to learn about "unique" issues around a project that forest officials may not be aware of.

"We're looking for specific comments that will help us identify the issues related to the project," Slacks said. "We're looking for specificity and other alternatives that might be identified."

Of the 5,085 comments received, analyzing software identified 500 duplicate form letters, Slacks said, which were not included in the documents website.

Of the remaining 4,585, forest officials identified 1,083 that contained "unique" comments. However, all 4,585 comments may be viewed.

Slacks said most of the comments were opposed to the project and that "a handful" expressed support for allowing the exploratory drilling.

The software used to examine the comments was sophisticated enough to identify form letters and contained algorithms that could compare letters. The software could also identify potential threats and "foul language," Slacks said.

The decision on whether to allow Lucky Minerals a categorical exclusion or to require a more stringent analysis — either an environmental assessment or an environmental impact statement — rests with the Yellowstone Ranger District.

Forest officials have said they don't expect to have a decision until later this year.

The website address for viewing the comments is http://www.fs.usda.gov/project/?project=47041. Click on the link "Public Comment Reading Room" found on the right side of the page.

THE LIVINGSTON ENTERPRISE

Thursday, August 20, 2015 * Livingston, Montana * Vol. 105 No. 224

Emigrant Peak mine exploration

Thousands comment on company's plan before deadline

By Liz Kearney
Enterprise Staff Writer

Midnight tonight is the deadline for submitting comments on the Emigrant Peak exploratory mining plan proposed by a Canadian firm.

The Montana Department of Environmental Quality has received about 1,700 comments, an agency spokeswoman said, and the Custer Gallatin National Forest has received about 4,100 on the proposal by Lucky Minerals to drill up to 80 exploratory bore holes on public and private land on Emigrant Peak and along portions of Emigrant Creek.

However, the two comment figures do not take into account comments that might have been sent to both agencies, U.S. Forest Service Project Lead Peter Werner said Thursday. He added that past reports of 5,000 comments being received was an overestimate.

Michelle Uberuaga, the Park County Environmental Council's executive director, said the council has been busy educating the public about the proposal and encouraging people to submit comments to the Forest Service and DEQ. The council's position is it wants to see the Forest Service conduct a full environmental impact statement on the exploratory drilling operation.

"Even exploratory drilling, if not done right, has the potential" to harm the environment, Uberuaga said Thursday.

Forest Service officials have said the comment period is "not a vote."

Uberuaga said that even though it's not a vote, the comment period is an opportunity for the public to weigh in on the proposal, and that officials with the Forest Service and DEQ have the responsibility to take the public interest into consideration.

Chico Hot Springs Resort owner Colin Davis is vehemently against the proposal moving forward at all.

"I have a letter signed by 70 business owners asking Lucky Minerals to go away," Davis said Thursday.

He said mining companies certainly have rights, but he maintains he has rights as well as a business owner downstream from the project.

"I feel like I should have a vote — my business has been here for 115 years," Davis said.

Davis would like to see an EIS conducted, too.

"If this is a good idea and a safe idea, let's have an environmental impact statement and prove it," he said.

"It's a process, not a popularity contest," Shaun Dykes, vice president of Lucky Minerals, said Thursday morning about his proposal.

Dykes said the concerns raised by environmentalists are "hysteria" and not an accurate depiction of his proposal.

A full-fledged mining operation could take 10 to 20 years develop — with environmental reviews at every step — and that he won't even know if there's enough mineral to war-rant further investigation until his bore holes can be drilled, Dykes said.

THE LIVINGSTON ENTERPRISE

OPINION Thursday, August 20, 2015

IN THE MAIL

Exploratory drilling in geothermal resource area is idiotic

Editor:

Today is the last day for additional comments to be received by the US Forest Service–Custer-Gallatin National Forest on the proposal for drilling up to 70 test holes in the Emigrant Peak area. Lucky Minerals Inc., out of Canada, believes there are commercial opportunities for them if their drilling proves successful. The USFS cited two very old and outdated mining laws as justification.

However, what Lucky, and clearly the Forest Service hasn't realized is that Congress, via the Geothermal Steam Act of 1970, The Federal Power Act Amended 2003, and the Energy Policy Act of 2005 created what is now enabled by law as "Known Geothermal Resources Areas."

These KGRA's are a result of, and scientifically discussed in a 200-page report published by the U.S. Geological Survey in 1991, after the Church Universal and Triumphant (CUT) wanted to utilize geothermal steam to power their complex at Corwin Springs near Yellowstone Park.

CUT dug a single well in 1986, at about 150 meters in depth, across the river from the LaDuke Hot Springs. They pumped the steam/water at 25/litres per second for 13 hours. That one well resulted in a 92 percent *reduction* in the flow of LaDuke Hot Springs.

Public and governmental concerns over the potential effects on thermal features within Yellowstone National Park from long-term production from this well and other such wells that might be drilled with the Corwin Springs KGRA led to a suspension of all geothermal leasing activities on public lands surrounding the Park in 1988 (Public Law 100-443).

Just last year, the USGS published and updated a similar version of this report focusing on the geothermal dynamics of the Old Faithful Geyser. This report was authored by an esteemed group of scientists known as the "Old Faithful Science Review Panel." That amazing study examined the effects of surface development (buildings, hotels, road, parking lots, etc.) on the geothermal impacts on the Old Faithful Geyser. The impacts were frightening and eye opening to the scientific community, let alone park management.

After even the most novice of laypersons were to read any random chapter of either particular report, they would conclude that to allow any drilling in any known geothermal resource area would simply be, at best, idiocy; and at worst, potentially cataclysmic. Reading both reports written by such esteemed groups of scientific experts and scholars on geothermal areas, many of which are in our backyard, and geothermal science in general, it

boggles the mind that any organization, any agency, any corporation, or even any single person would think they could drill even one hole in the Chico Hot Springs KGRA, let alone up to 70 test holes, and at depths up to 10 times (and more) than the shallow holes drilled by the scientists who put together the two abovementioned reports just 25 miles away, upstream in the Yellowstone River at Corwin Springs and LaDuke.

Chico Hot Springs and Emigrant Peak — in geological and geothermal terms — are within spitting distance of Yellowstone National Park and the Yellowstone Controlled Groundwater Area.

Bill Burris
Livingston

THE LIVINGSTON ENTERPRISE

OPINION Wednesday, August 19, 2015

The Emigrant Creek Mine is a bad deal

Guest column by BILL STODDART

There's a haunting line in the October 1993 issue of National Geographic: "All the water in the world that will ever be is, right now."

Water — it is essential for life and fuels limitless opportunity. Why should we trade short-term material gain for the benefit of a few in exchange for an enduring resource that benefits millions?

As it turns out, the Yellowstone River — the longest undammed river in the lower 48 — is facing just such a dilemma. Many folks in southwest Montana are aware that a Canadian company, Lucky Minerals, is hoping to hit a jackpot of gold, silver and copper in the Emigrant Creek drainage, a tributary of the Yellowstone 30 miles north of our nation's first national park.

The company is currently seeking permits from state and federal agencies for exploratory drilling. But if those sites demonstrate a mineable ore body, Lucky Minerals will likely find some very interested suitors. Few dispute that our technological world depends upon mining, but this particular mine could easily damage the Yellowstone, and the costs would far outweigh the mine's benefits.

Lucky Minerals' 43-101 technical report describes an ore body with widespread, disseminated sulfide minerals containing copper, molybdenum, zinc and lead. Oxidation of sulfide minerals forms sulfuric acid, and the leaching of metals from ore and waste rocks can lead to Acid Mine Drainage (AMD) into surface and groundwater. There are no naturally occurring rock types, such as limestone, that could neutralize AMD in the Emigrant Creek ore body.

Picture the Berkeley Pit — the ever-rising electric green lake in the heart of Butte — a toxic legacy of mining "The Richest Hill on Earth." The minerals in the Emigrant Creek drainage are very similar to those found in Butte, which also destroyed the Upper Clark Fork River for 120 miles downstream. Both of these areas are among the largest Superfund sites in the country. If a mine was developed in the Emigrant Creek watershed, millions of tons of toxic tailings and waste rock would have to be managed in an area with high snowfall and frequent seismic activity, exposing Emigrant Creek and the Yellowstone River to the threat of AMD.

Larger scale mining in Emigrant Creek could also jeopardize current economic drivers such as agriculture, fishing, tourism, construction and the corresponding service economy that have supported thousands of families throughout the region for generations. County, state and federal data sources show no metals mining jobs in Park County at present. In

contrast, an estimated 30 percent of total employment, not including self-employed outfitters, guides and others, is derived from tourism-related enterprises, while agriculture makes up another 5 percent of area employment.

Mining jobs pay much more than seasonal work because of the technical training required, but developing this mine will not create better-paying jobs for local workers; rather, those workers will be imported from elsewhere. In fact, this mine could deprive many locals of their livelihood and decimate property values throughout Paradise Valley to boot. Over its relatively brief existence, the mine may generate substantial revenues for its shareholders and extract materials for our array of technological devices, but the potential risk of trading the lifeblood of the Yellowstone ecosystem for cash and gadgets does not pencil out. One need only look to our southern neighbors on the Animas and San Juan Rivers to see a recent example of a good plan gone awry.

As citizens responsible for protecting this invaluable resource for future generations of ranchers, farmers, fishermen, recreationists and literally millions of others who hope to enjoy the Yellowstone's waters or who may otherwise foot the bill, this is a call to stop the Emigrant Creek mine before it even gets started.

The Montana Department of Environmental Quality and the U.S. Forest Service have extended the public comment period on the company's permits for exploratory drilling until Aug. 20. Contact the U.S. Forest Service (FS-comments-northern-gallatin@fs.fed.us) and the State of Montana Department of Environmental Quality (Craig Jones: deqmepa@mt.gov) to register your concerns and encourage local, state and federal officials to require a full Environmental Impact Statement to determine whether mining sulfide deposits is a worthwhile economic activity in the Yellowstone watershed.

EDITOR'S NOTE: Bill Stoddart owns a financial consultancy and advisory firm in Bozeman and is a member of Business for Montana Outdoors.

THE LIVINGSTON ENTERPRISE

OPINION Tuesday, August 18, 2015

IN THE MAIL

In favor of exploratory drilling

Editor:

We need mining. I'm in favor of the exploratory drilling for metal resources on Emigrant Peak.

We all need the mining industry to continue in order to provide us with the raw materials we need for our cars, computers, schools, fishing poles and light-weight walking sticks, plus much more.

We have to mine for metals and minerals we all need, where nature has deposited them. They don't fall out of a magic cloud that floats by overhead. You could argue that some people around here believe this.

It would be too valuable to know what potential assets we might have up there.

John Usher
Livingston

THE LIVINGSTON ENTERPRISE

OPINION Friday, August 14, 2015

IN THE MAIL

Community Foundation opposes Emigrant mine exploration proposal

Editor:

It is with our mission, vision and operating principles in mind that the Board of Directors of the Park County Community Foundation for the first time in its history is compelled to speak publicly on an issue that could have perpetual implications on our county.

Because of its long-term implications, the Board of Directors views with grave concern the proposal from Lucky Minerals for exploratory drilling on public and private lands in the vicinity of Emigrant Peak on the east slope of the Paradise Valley.

To begin, we recognize the statutory right of Lucky Minerals under existing state and federal laws to propose its exploratory drilling activities which may or may not lead to actual mining activity. That said, we also recognize the difficult lessons learned as a result of Montana's history — that mining leaves permanent negative impacts that would perpetually affect our community in myriad ways:

- Economically, immediate and after-effects are almost too many to contemplate. Implications would affect local homeowners, businesses, farmers, ranchers, tourism flow into and out from the region of the northwest entrance at Yellowstone National Park. Livingston's legacy as "Gateway to Yellowstone" would be forever altered.
- Significant potential exists for air and water pollution emanating from this and any other mining or mining-related activities.
- Habitat damage is all but inevitable within the proposed drilling area, directly impacting the well-being of wildlife inhabiting that area.
- The "sense of place" cherished by Park County residents would be inalterably diminished. Additionally, the Forest Service lands involved in the Lucky Minerals proposal belongs to every American citizen; damage to these lands would violate the trust in which they are held.
- All manner of recreation during all seasons would be severely disrupted if not curtailed.
- It is unlikely that our local governments have either the ability or the flexibility to manage adverse impact activities brought on by mining exploration/activities, and it is dubious that they have the financial resources to support mitigation effects. Of particular concern is potential truck traffic that would threaten the existence of an iconic Montana resort and

seriously disrupt other nearby businesses. We note the current concerns for the safety of Highway 89 South, a hazardous route which would be further jeopardized by mining-associated traffic.

- Based on publicly available information, it is unclear whether Lucky Minerals bas the assets to perform the work identified and whether it is financially capable of satisfactory and appropriate remediation should an adverse situation develop in the course of its work.

- Examination of the cumulative impacts related to the proposal must be fully examined to include where ore, if it is mined, would be processed. The question of when and where ore processing would be done is a high-impact issue for the entire community.

The Forest Service reported that "this area was previously explored in a similar fashion in 1991" with "no apparent environmental ill effects." Relating to this specific proposal, we believe that socio-economic-environmental factors have dramatically changed over the past quarter-century to the extent that the level of review for this proposal should be substantially expanded beyond a "routine" action. For the greatest level of transparency and available information for the public, the Board of Directors of the Park County Community Foundation respectfully urges that the Lucky Minerals proposal not receive a "categorical exclusion" from the National Environmental Policy Act (NEPA) and that at a minimum, a full Environmental Impact Statement be conducted.

Peter D. Fox, for the Park County
Community Foundation Board of Directors

THE LIVINGSTON ENTERPRISE

Tuesday, August 11, 2015 * Livingston, Montana * Vol. 105 No. 217

Extensive review sought for mine exploration plan

By Liz Kearney
Enterprise Staff Writer

GARDINER — Local environmental organizations say they want the U.S. Forest Service to conduct a full-blown Environmental Impact Statement on a Canadian mining company's proposal to drill exploratory bore holes on the flanks of Emigrant Peak.

About 60 people gathered in the Gardiner Community Center Monday night to hear a presentation jointly produced by the Bozeman-based Greater Yellowstone Coalition and the local Park County Environmental Council, the third such meeting the groups have held around Park County since mid-June.

The organizations are opposed to a proposal by Lucky Minerals of Vancouver, Canada, to conduct mining exploration for gold, silver, copper and molybdenum on public and private lands on Emigrant Peak and along watersheds that feed Chico Hot Springs and the Yellowstone River.

The mining company filed a request with the Custer Gallatin National Forest for a "categorical exclusion" for the drill sites and core samples it proposes to dig. A categorical exclusion receives the lowest level of scrutiny before a permit is issued by a government agency.

Shaun Dykes, vice president of Lucky Minerals, said in an email in response for comments on the record, that his company intends to proceed with its explorations despite the "conjecture and fear mongering from the anti-mining groups protecting their own self interests."

The environmental groups want the Forest Service to conduct a rigorous study of the proposal — an environmental impact statement — which looks not only at the short-term proposal but also at alternatives as well as evaluating mitigation efforts, Earth Justice staff attorney Jenny Harbine explained at the Monday meeting.

Dykes said a full-blown EIS is not required for the "small amount of work we are currently proposing."

GYC Montana Conservation Advocate Joe Josephson noted the Lucky Minerals plan of operation submitted to the Forest Service states there are "millions of ounces" of gold in the proposed project area.

"They don't propose these things if they don't intend a full-fledged mine," Josephson said.

A local member of Protecting Paradise, an advocacy group based in Paradise Valley, said the organization does not want the project "segmented," with small pieces of the overall project approved one segment at a time.

THE LIVINGSTON ENTERPRISE

OPINION Thursday, July 23, 2015

EDITORIAL

Right decision to extend mineral exploration comment

Federal officials made the prudent decision this week in deciding to extend the comment period for the proposed mineral exploration project on Emigrant Peak.

Park County residents learned about the project only in June and originally had until July15 to submit a comment.

That seemed like too narrow of a deadline for a mine exploration project, which includes drilling some 30 holes at 12 locations roughly 7 miles southeast of Emigrant in Paradise Valley.

Already, the U.S. Forest Service has received about 2,600 comments on the proposal and the editorial page of this newspaper has been active with letter writers penning opposition to the project, which is proposed by Lucky Minerals of Surrey, British Columbia. The Park County Environmental Council, or PCEC, has worked to spread the word about the proposal and educate the community by organizing public meetings.

The project has been largely met with opposition and that's understandable. Unfortunately, Lucky Minerals Vice President Shaun Dykes responded in a July 13 letter to the editor by saying, "The recent headlines in regard to proposed exploration work on the upper reaches of Emigrant Creek are based on scare tactics and fear mongering by various local environmental groups."

The terms "scare tactics" and "fear mongering" do not seem a fair representation of the Park County residents who have legitimate concerns about the possibility of a mineral exploration project so close to Yellowstone National Park in Paradise Valley.

Perhaps Lucky Minerals and its representatives might consider hearing out the contrary opinions of those who live and work in Park County rather than use clichés in an effort to discount concerns over the proposal.

Of course the proposal has captured Park County's attention. Anyone who has visited Paradise Valley, floated and fished the Yellowstone River, soaked or dined at Chico Hot Springs understands why a project that could lead to mining activity on Emigrant Peak makes some people uneasy.

Lucky Minerals, in a public document filed with the Forest Service, lists the Emigrant Project as Park County, "Idaho."

Possibly a simple oversight, but perhaps symbolic of this Canadian company being out of touch with local concerns for this extraordinary area of Montana.

The Forest Service has extended the public comment period until Aug. 20, giving area residents the time they need to fully examine Lucky's proposal and log public comments on the matter.

For information about the project, visit www.fs.usda.gov/custergallatin. From there, click the "NEPA and Public Scoping Documents" tab on the right side of the page.

Comments should be submitted to Peter Werner, Project Lead, Custer Gallatin National Forest Supervisor's Office, 10 E. Babcock St., Bozeman, MT 59715; or email FS-comments-northern-gallatin@fs.fed.us. Call Werner at 587-6962 for more information.

— Justin Post
Enterprise Managing Editor

THE LIVINGSTON ENTERPRISE

Tuesday, July 21, 2015 * Livingston, Montana * Vol. 105 No. 202

Comment period extended on drilling proposal

By Liz Kearney
Enterprise Staff Writer

Federal officials have extended the comment period for the Emigrant Peak area mineral exploration project proposed by a Canadian mining company.

The Custer Gallatin National Forest and the Montana Department of Environmental Quality are extending the comment period until Aug. 20 on a proposed mineral exploration project located approximately 7 miles southeast of Emigrant.

Submitted by Lucky Minerals Inc., the proposal will assess copper, gold, silver and molybdenum potential by drilling up to 30 exploration holes from 12 drill locations, a Custer Gallatin National Forest news release said.

"We are extending the comment period to ensure ample opportunity for public input," Yellowstone District Ranger Alex Sienkiewicz said in the release. "Public comment helps to determine significant issues that may arise, but comments do need to be substantive to the exploration project at hand. Once comments are received, the Forest will analyze feedback from the process and subsequently, this information will help us to determine the level of analysis to be applied to the proposal at hand. We have not yet made this determination."

Local environmental groups and many area residents have spoken out against the proposal, which they say could lead to a large-scale mining operation. In two public meetings held recently in Emigrant and Livingston, residents spoke about their concerns, which included the potential for a large-scale mining operation that could harm sensitive habitat, wildlife and watersheds close to Yellowstone National Park and Chico Hot Springs Resort.

Michelle Uberuaga, executive director of the Park County Environmental Council, applauds the comment period extension.

"PCEC agrees with the decision to extend the comment period, and we look forward to the opportunity to educate our community on the issue so community members can participate in the process in a meaningful way," Uberuaga said Tuesday.

Shaun Dykes, a vice president of Lucky Minerals, said in a letter to the editor of The Enterprise last week that a large-scale, open-pit mining operation "is never going to happen, as it is not possible or practical for that area."

Lucky Minerals' technical reports states the "overall target is a multimillion ounce gold property with significant copper, silver by products."

A U.S. Forest Service spokeswoman told The Enterprise last week the agency had received about 2,600 public comments by July 15, the comment period's original deadline, and she expected up to 2,800 comments.

The drill sites are located within four unpatented mining claims on the western flank of Emigrant Peak and five unpatented claims on the eastern side of Emigrant Creek. Exploratory drilling would occur in 2016.

Proposed activities would involve conducting core drilling at up to nine sites within the existing prism of Forest Service Roads #3272 (Emigrant Creek) and #3273 (Emigrant Peak).

Two of the proposed drill sites along Forest Service Road #3273 are located within the North Absaroka inventoried roadless area. Three of the proposed drill sites located east of Emigrant Creek would be accessed via helicopter. The three helicopter-supported sites would occupy drill sites previously used in 1991, the release said.

To minimize new disturbance, no new road construction is proposed for the project. Once all exploratory drilling is completed, the drill holes would be plugged, the drill pads would be reclaimed, and all incidental disturbances would be restored to a pre-drilling condition, according to the Forest Service news release.

Project information, including the Emigrant Project Mineral Exploration Plan of Operations, is available online at www.fs.usda.gov/custergallatin. Click on the right-hand quicklink NEPA and Public Scoping Documents.

Comments on the proposal should be submitted by Aug. 20 to Peter Werner, Project Lead, Custer Gallatin National Forest Supervisors Office, 10 E. Babcock St., Bozeman, MT 59715; or by email to FS-comments-northern-gallatin@fs.fed.us.

For more information, call Werner at 587-6962.

THE LIVINGSTON ENTERPRISE

Thursday, July 16, 2015 * Livingston, Montana * Vol. 105 No. 199

Thousands comment on Emigrant mine proposal

By Liz Kearney
Enterprise Staff Writer

The U.S. Forest Service says it received about 2,600 electronic comments on a proposal by a Canadian mining company to explore for gold and other minerals on Emigrant Peak in Paradise Valley.

The public comment period ended yesterday, but Custer Gallatin National Forest spokeswoman Marna Daley said comments are still arriving, and she expects about 2,800 comments in all on a proposal by Lucky Minerals to drill exploratory drill holes on public and private land in the Emigrant Peak and Emigrant Creek area.

The proposal is to drill bore holes about 7 miles southeast of Emigrant, a June 3 Forest Service news release announcing the proposal said.

Daley said Forest Service staff would begin reviewing the comments, and that the Forest Service response could take a couple of months.

Daley said officials especially consider "substantive comments," those that make a case for why a project should receive closer review.

"This isn't a voting process," Daley said. "It's the environmental issues and concerns people have that will help determine how we move forward."

No "ground-disturbing" work is allowed to proceed, Daley said, until the Forest Service issues a response to comments received on mining or other proposals made for public lands.

Local environmental organizations held two public meetings recently to present the company's proposal.

Residents who spoke publicly about the project at the meetings, held in Emigrant and Livingston, were opposed to the drilling.

They cited concerns about the quantity and quality of water reaching tributaries of the Yellowstone River; increased traffic on both U.S. Highway 89 and the county road that passes through the Chico Hot Springs Resort; access to recreation areas in the national forest; and threats to habitat of endangered species, including grizzly bears.

THE LIVINGSTON ENTERPRISE

OPINION Wednesday, July 15, 2015

IN THE MAIL

Too many risks from Lucky Minerals' proposed exploratory drilling

Editor:

Protecting Paradise is a nonprofit organization created by a group of residents in the Paradise Valley. Protecting Paradise is dedicated to enhancing the lives of people who live, work, and recreate in Paradise Valley, by respecting this beautiful environment.

Protecting Paradise also believes in and supports individual property rights. But the organization recognizes that sometimes individual property rights conflict with public rights. This occurs when some activity on private property subjects the public at large or other land owners to risks and/or costs for which they are not compensated for or protected from.

Economists call these "Social Costs."

When "social costs" are high, a very high standard of permitting must be established. Only when "social costs" are carefully considered can decisions be made that fairly balance the rights of private property owners with the rights of the community.

It is well understood that mining presents extremely high "social costs." It is a complex, costly, and inherently dangerous activity. The Lucky Minerals initial request for 12 bore holes on both private and public land seeks to disguise this fact. We believe these actions could individually and cumulatively have a significant effect on the human environment.

Here are just a few of the risks and costs to which the community is exposed when mining activities take place:

- The risk of water contamination involving heavy metals and other health threatening elements. Diversion systems, containment ponds, groundwater pumping systems, subsurface drainage systems, and subsurface barriers all can fail, causing untold damage to water. In both hard rock mining (tunneling), and open-pit mining, there is an ever-present danger of sulfuric acid generation and subsequent contamination of the water supply. The creeks that would be affected by the Lucky Mine all drain into the Yellowstone River, which provides drinking water for thousands of residents downstream.
- The risk of air contamination involving the discharge of toxic metals and other elements released when rock is broken.

- The risk to endangered species. In this case the mining activities are to take place in active grizzly and Canada lynx habitat, both of which are often observed in the Emigrant Peak watershed. We believe this would cause substantial controversy on environmental grounds.
- The risk of ruining the North Absaroka Roadless Area and the adjacent Absaroka-Beartooth Wilderness. Many visitors and residents access these areas for recreation through the Six Mile, West Mill Creek and Emigrant Creek drainages.
- The risk of economic impact. This actually cuts both ways, as mining activity does create jobs. But, the job killing effects of a mine would be far greater. The Yellowstone National Park 2014 economic report states that YNP creates nearly $382,000,000 in spending, which supports 5,300 jobs in the area. We believe they would be put at risk.
- The risk to tourism. The increased traffic, potential scenic impact, costs to a historic resort complex (Chico Hot Springs), the disruption of an area used for our recreation caused by this mine, all have economic impact. Further, as the northern entrance to the "crown jewel" of the American park system, any activities that compromise the pristine Paradise Valley environment also threaten the gateway communities of Yellowstone National Park. This is a unique place.
- The risk of unfunded potential liabilities. Lucky Minerals Inc. is one of many publicly traded penny-stock Canadian mining companies. Their balance sheet is weak, and their last filed report shows only $650,000 in liquid assets. They are in no position financially to meet any serious liabilities that might arise should problems occur during the mining process. Any promises made by the company in terms of safety, reclamation, etc. may be compromised by their weak financial condition.

There are precedents for requiring an EA for this type of exploratory drilling. In 1992, an EA was performed when Pegasus Gold Corporation and Harrison Western Mining Corporation applied for exploratory activities. Another EA was required in 1997 for just five drill sites.

We believe that failure to also require an EA for Lucky Minerals would result in significant inconsistencies with regard to Federal and State law relating to the environmental aspects of the action.

But, Protecting Paradise believes that an EA is not enough. The high social, environmental and economic costs associated with this issue demand stronger action. The importance of this issue suggests that only a full Environmental Impact Statement will allow for a reasoned decision, a decision that will give the community and the private property owners a sense that every effort was made to balance the interest of all affected parties.

Again, for the record, Protecting Paradise is fundamentally opposed to the Lucky Mine.

Anthony Eaton, President
and the Protecting Paradise Board

THE BOZEMAN DAILY
ENTERPRISE

OPINION Tuesday, July 14, 2015

IN THE MAIL

Mine exploration would be a disaster for the area

Editor:

Please reject the proposal for the exploratory mine in the Emigrant Gulch area.

This idea is a disaster for a number of reasons.

Emigrant Gulch is part of the Greater Yellowstone Ecosystem and should not be opened up to the ravages of mining.

The disastrous consequences to the Yellowstone watershed area, wildlife and the environment cannot be overstated. The waste products of mining flowing into the watershed and eventually the Yellowstone River could pollute the river for endless miles and countless years. The impact on our environment, our resources and our beautiful river is unacceptable. There has been a pipeline disaster on the Yellowstone River. It was never supposed to happen. It happened.

The proposal from a Canadian company ensures the ravaging of this very special area with no apparent benefit to the people who live there, the tourists who provide income and the people who recreate there. Really ... we're going to sell away our precious resources to Canada?

If the exploratory mine is successful, it's been presented to us that the Lucky Minerals company could lead to future mining operations stretching across more than 2,560 acres of Emigrant Peak. We have been told there could be an open pit three times the size of the Berkeley Pit in Butte. What benefit does this provide vs. the horrors that would occur? As we see our national lands being developed and not treasured, we look to you to protect and preserve this special place.

We met at Chico 41 years ago and have owned property in Paradise Valley for 38 years. We have worked for the betterment of the people of the state and support appropriate development. We believe that Montana is "The Last Best Place" and hope that you will continue to keep it that way. We are counting on you.

Susan and Jeff Bridges
Paradise Valley

THE LIVINGSTON ENTERPRISE

OPINION Monday, July 13, 2015

IN THE MAIL

Stop this project before it even gets started

Editor:

Emigrant Peak is an invaluable resource, not because of gold. Soaring above the Paradise Valley, the peak is integral not only to Park County's magnificent landscape; it is integral to the health of our natural resources and economy.

When the Park County Environmental Council received a notice from the U.S. Forest Service on June 2, 2015, that a Canadian company planned exploratory drilling in Emigrant Gulch and on Emigrant Peak, we were naturally concerned. But it wasn't until we took a hard look at the Lucky Minerals website and technical documents that we realized that Lucky Minerals had documented plans for an aggressive, multi-phased exploratory drilling project on public and private land. Ultimately, Lucky Minerals has an interest to mining claims on approximately 2,500 acres reaching into three drainages (Emigrant Creek, Six Mile and the West Fork of Mill Creek) in our backyard.

While the company accuses Park County Environmental Council and other groups of hyperbole, Lucky's plans are clearly set out in publicly available documents on its website. Attempts to disavow those plans in the face of public criticism are disingenuous. According to the company's own technical report found on its website, "The purpose of the program is to produce a multi-million ounce gold, 43-101 complaint resource for the project and its various zones."

If Lucky Minerals has its way, Park County residents and visitors could lose access to vast amounts of public land in the Absaroka Mountains for hunting and recreation. And the mine's impact could extend well beyond its footprint. Lucky Minerals' plans to extract gold from sulfide-bearing rock. When exposed to air and water, sulfides react to form sulfuric acid in a process known as acid mine drainage. Acid mine drainage is highly toxic to fish and other aquatic life. It is through this process that other hard-rock mines in Montana — including the Golden Sunlight, Zortman/Landusky, and Kendall mines — have left a legacy of contamination of ground and surface waters that will last for generations.

Lucky Minerals surely hopes to avoid these problems in the Paradise Valley. But if it is not successful and joins the ranks of almost every other hard rock mine in Montana, it will have polluted Yellowstone River tributaries and spoiled public and private lands for recreation, hunting and fishing, and ranching. Park County's economy and landscape could be forever harmed.

That's why it is so important to stop this project before it even gets started. Lucky Minerals currently proposes drilling at 35 sites, but documents on the company's website reveal that

it already is planning even more exploration. Lucky Minerals is just getting its foot in the door; we need to slam it shut.

Park County residents have come out in force to oppose exploratory drilling on Emigrant Peak. Nearly 100 people turned out for a community meeting in Emigrant and more than 150 people gathered at the Livingston Elks Lodge to learn more about Lucky Minerals' exploration plan and how to comment on the proposal. At each meeting, there were a lot of questions, but mostly an overwhelming sense of community responsibility to speak up and protect the Paradise Valley, the Yellowstone River and Chico Hot Springs. The community meetings were open to the public and well publicized. Lucky had every opportunity to send a representative to speak to the community and to attend the public meetings, but did not attend.

At the Livingston meeting, Chico Hot Springs owner Colin Davis spoke about the 180 families that Chico employs and expressed his concern that mineral exploration up the Gulch could have significant impacts on Chico's operation and livelihood — clean, hot water. A co-founder of Warriors & Quiet Waters spoke up about the invaluable power of the Yellowstone River and this ecosystem to provide a place for wounded warriors to heal. And he was the third speaker that moved me to tears. The energy in the room was palpable. Not hysterical — it was a thoughtful community discussion about why the Paradise Valley, Chico Hot Springs and the Yellowstone River are too special to risk with industrial mine development.

The Forest Service and Montana Department of Environmental Quality are currently considering Lucky Minerals' exploration proposal. The agencies have signaled that the plans could be approved without any environmental analysis. We are encouraging our community to send public comments to the U.S. Forest Service and Montana Department of Environmental Quality by the July 15 deadline. Please go to PCEC's website to learn more: www.envirocouncil.org. Or contact me, Michelle Uberuaga, at michelle@envirocouncil.org or call my cell at (406) 223-4714.

Michelle Uberuaga, Executive Director
Park County Environmental Council

THE LIVINGSTON ENTERPRISE

OPINION Monday, July 13, 2015

IN THE MAIL

There is hope for those opposing mining operation in Paradise Valley

Editor:

My wife and I attended the informational meeting sponsored by Greater Yellowstone Coalition last week concerning Lucky Minerals' proposed development in Emigrant Gulch. We were very encouraged by the great turnout and appreciated the Coalition's presentation of this project. We found the overall sentiment of those in attendance to be a mixture of shock, sadness, and anger. However, we wanted to provide a few words of encouragement as we begin the process of evaluating this project.

Attending this meeting gave me a strong sense of "déjà vu." Having lived in Alaska, I spent several years opposing the Pebble Mine Project. Many know this proposed project as one of the largest open-pit sulfide copper and gold mines in the world, placed right in the middle of Bristol Bay — the last, greatest wild salmon producer left on the planet. This project was also proposed by a Canada-based mining company (Northern Dynasty) along with foreign partners, together called the Pebble Limited Partnership.

Sitting in the early meetings, the situation seemed hopeless. Pebble Limited Partnership was investing hundreds of millions of dollars annually ($680 million in 2013 alone!) on exploration, marketing, socioeconomic studies, and cash infusions into the local economy. The situation appeared dire: The governor of Alaska wanted the project, the state legislature wanted the project, the state DNR wanted the project, and the permitting process was altered to fast track it.

Then something wonderful happened. The people spoke up! Ninety percent of the residents of Bristol Bay opposed the project. The citizens of Alaska voted three times in state referenda to reject the project (although Governor Parnell nullified the vote all three times). Nationwide momentum by sportspeople and concerned citizens began to build. Several major retail jewelers (Tiffany, Zales, Boucheron) promised not to buy gold from this mine.

Slowly, steadily, it began working. All of the major partners in the Pebble Limited Partnership, except one (Northern Dynasty), pulled out, citing negative public reaction and a growing likelihood the permit would not be approved. Northern Dynasty is not able to find new partners to finance the project. The EPA correctly determined that the risks to Bristol Bay and the $500 million salmon industry are too great and will not approve the project. Rules were changed and the Alaska State Legislature now has the power to deny permits for mining projects. The Pebble project is currently on hold and under debate.

There is hope for those opposing a mining operation in the heart of Paradise Valley. The power of the public voice still wields strength. If you disagree with Lucky Minerals' plan, begin drafting letters to your city commissioners, mayor, governor, DNR, state and federal legislators. Tell everyone about this issue and attend meetings to begin building momentum.

Many Alaskans and Montanans are not anti-mining. We do realize, however, that there are places on this planet (Bristol Bay, Paradise Valley, Skeena River, Chuitna River, Smith River) whose ecosystems, and the employment that depends on them, are too valuable to risk.

Gary and Lisa Miller
Livingston, Montana

THE LIVINGSTON ENTERPRISE

OPINION Monday, July 13, 2015

IN THE MAIL

Comments on Lucky Minerals' proposed exploratory drilling

Editor:

After attending two meetings on the proposed Lucky Minerals, Inc. exploration drilling proposal in the Emigrant Peak area of Paradise Valley, one meeting in Emigrant and the other in Livingston, I would like to comment on the proposal and the explanations that were given about this proposal.

First, that the company has asked for an exclusion from an environmental assessment or EIS for the first phase of their exploration. The question is why are they asking for an exclusion? There seems to be some confusion about Lucky Minerals' future plans. It was stated at the first meeting that all of their drilling would be on the eastern side of Emigrant Peak. Then when I looked up the document entitled "Lucky Minerals, Inc. Emigrant Project Plan of Operations for Drilling activities" on the Internet, it stated that they would be drilling on the "four unpatented mining claims on the west flank of Emigrant Peak and five unpatented claims on the east side of Emigrant Creek." I was told later that the word "west" was a typo!

It was also stated in the same document that "Exploratory drilling to assess mineral presence at nine sites on existing roads and three helicopter sites in Emigrant Creek area. Total disturbance of approximately 0.3 acres." Will these "roads" have to be improved to get drilling equipment in? Will helicopter pads or landing sites have to be established to get equipment in? If so, I would suggest that much more than 0.3 acres of total land will be disturbed.

I was also surprised to hear the mining law under which some of the regulations governing this exploration proposal fall is dated 1872! This was mentioned several times at both meetings. Obviously, drilling and mining techniques have changed considerably since 1872. Why hasn't this law been updated?

The Forest Service is accepting comments on the proposed drilling until July 15, and we were told that the Montana Department of Environmental Quality (MDEQ) might also have a comment period if enough public interest is shown.

Close to 250 people attended the two meetings I attended. I would certainly consider that this is enough public interest to warrant a comment period for the MDEQ.

William C. Edwards
Livingston

THE BUTTE SUN
ENTERPRISE
OPINION Monday, July 13, 2015

IN THE MAIL

Jobs and the environment don't have to be mutually exclusive

Editor:

The recent headlines in regard to proposed exploration work on the upper reaches of Emigrant Creek are based on scare tactics and fear mongering by various local environmental groups. It is unfortunate that the various groups chose not to invite company representatives to the meetings held locally. That way the true facts of Lucky's proposed work would be made clear, instead of the hysterics that appear to have dominated the meetings.

To be clear, there are no plans to perform any sort of mining on Emigrant Creek. The large-scale, open-pit mining being presented by the local environmental groups is never going to happen, as it is not possible or practical for that area. Reference to the Butte Superfund site are out of date and fail to take into account the huge progress being made in the environmental regulations and enforcement. It should be noted that no hard-rock mine permitted in the West after 1990 has ever been placed on the EPA's Superfund National Priorities List. The reason is simple. Current hard-rock mine regulation is protecting the environment.

Lucky Minerals (Montana) Inc. is a Montana company that is planning to explore mining claims located in the upper reaches of Emigrant Creek. Emigrant Creek has a long history of exploration and gold mining going back to the 1880s, and exploration and mining are part of the local culture of the region. It is owned by a Canadian junior exploration company that has a large majority of U.S.-based shareholders.

Exploration is a multi-stage approach; at each stage the work and results are evaluated in order to determine if it is worth continuing and thus spending the millions of dollars required in the local community. The current proposed programs on private land and on USFS land is the first stage to determine what is present. If, and I repeat if, there is success, then additional work is planned and additional application filed for permits. At each stage, all interested groups are consulted and plans adjusted and adapted to ensure the work proceeds property and with no impact to the environment.

Lucky Minerals is simply trying to determine what if anything is present with the claim area. Until that is a known, there can be no discussion about mining. In fact, the odds of actually finding the mine are extremely low.

It is Lucky Minerals policy to hire local workers, local contractors and obtain all supplies locally, bringing benefits to the local communities. Stories regarding importing large numbers of outside workers are simply not true. Similar fictitious accounts of large

equipment and heavy road traffic in the area are again simply not true. Exploration, consisting of drilling several holes, has very minimal impacts and does not require heavy use of heavy-duty equipment other than regular road maintenance equipment. Lucky Minerals will work with local county officials to help in various aspects of maintaining roads and keeping all traffic to a minimum.

The area of Emigrant Creek is worked on a regular basis by many different individual groups and prospectors working mostly on the placer gold that is in the creek itself.

The United States is in serious need of metals, as opposition to any sort of mining at all costs has resulted in delays, increased costs and a move to supply the metals from overseas sources. Everyone needs metals from the cell phones to cars to the wiring in houses. As the USA becomes more and more dependent on foreign suppliers of these metals, it becomes more and more vulnerable. Many countries are now beginning to restrict the export of raw metals, instead electing to sell finished products only. This will have a serious effect on the USA's ability to produce finished goods and of course on the ability of the average worker to earn a decent wage and support his family. It's quite obvious that the average American working family is becoming an endangered species.

Today's modern mining and exploration techniques are highly regulated, highly sophisticated and have resulted in many safe and efficient mines. The Butte open pits cannot happen today. In addition, mining companies often create land trusts and fish hatcheries at their own expense and in partnership with environmental groups. The overall result is a substantial improvement to the environment, not degradation.

Let's keep a productive, fact-based dialogue going. Recent studies championed by local environmental groups employ cherry-picking of poorly operated, older mines to skew the data. Most of the concerns involve the use of cyanide, which is not used in the copper-gold process, and rely on data from before 1990, when cyanide management programs were nonexistent for metals mining.

Reclamation of damaged forest lands, hundreds of high-paying jobs, benefits to local businesses and protection of our many recreational uses of the land could result from a constructive dialogue.

Shaun Dykes, Vice President
Lucky Minerals (Montana) Inc.

THE LIVINGSTON
ENTERPRISE
Friday, July 10, 2015 * Livingston, Montana * Vol. 105 No. 195

PARADISE VALLEY

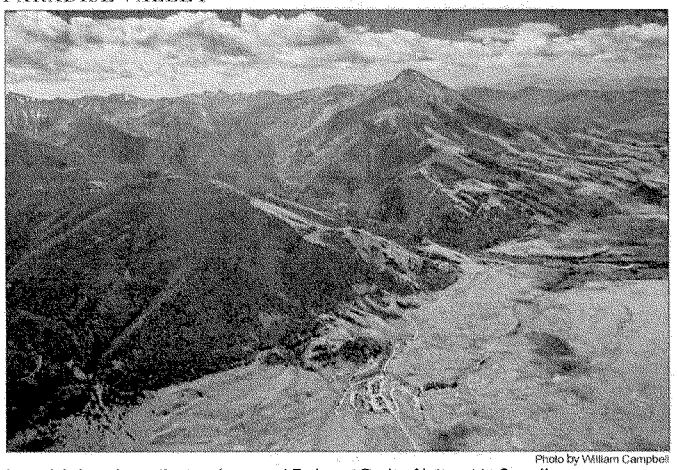


Photo by William Campbell

An aerial view shows the terrain around Emigrant Peak, of interest to Canadian company Lucky Minerals for mining exploration. Chico Hot Spring Resort is visible at the bottom center of the image.

EMIGRANT PEAK MINE EXPLORATION
About 140 people attend meeting on company's proposal

By Liz Kearney
Enterprise Staff Writer

A local environmental organization was chastised by locals Thursday night for not bringing enough "passion" to the fight to stop a proposed mineral exploration project on Emigrant Peak.

The Greater Yellowstone Coalition hosted a public meeting at the Livingston Elks Lodge Thursday night that was attended by about 140 people. The purpose of the meeting was to educate the public about a proposal by a Canadian mining company to drill exploratory drill holes for gold and other minerals on public and private land on the flanks of Emigrant Peak.

Lucky Minerals said in its proposal, which it was required by law to submit to the Custer Gallatin National Forest, that it will drill 12 bore holes on public land and 23 on private land to determine if further mining is financially and physically feasible.

GYC staffer Joe Josephson said the U.S. Forest Service officials in charge of reviewing the mining company's plans are required by law to consider only the proposal before them. Forest Service employees at the meeting said they are not allowed to speculate on the final outcome of proposals presented to them.

Enterprise photo by Hunter D'Antuono

Community members gather for a meeting to discuss concerns over possible exploratory drilling for a mine on the slopes of Emigrant Peak, at the Livingston Elks Lodge on Thursday evening.

But area residents opposed to the proposal who spoke at the meeting took issue with the law that prohibits officials from looking ahead and suggested the GYC should be instilling passion in mining opponents.

Wilderness guide and Park County resident Howie Wolke said citizens and taxpayers have a right to speak up and be heard.

"This is no place to explore for gold, and we need to send this message loud and clear," Wolke said, sitting down to applause from others at the meeting.

Livingston resident Joseph Scalia said the system is "horribly flawed" and there is a big difference between what is "legal" and what is "ethical."

Colin Davis, new owner of Chico Hot Springs Resort, is very much opposed to the project and said he has no doubts about where the drilling proposal is headed.

"There's no question where the end game is—an open pit mine," Davis said, speculating on the proposal's eventual outcome.

Marilyn Olsen said she cares about the health of the whole community, both human and otherwise, and is opposed to the mining proposal as well as the GYC's suggestion to keep comments focused on the project at hand.

"To limit our comments to the scoping document is bull__," she said after the meeting. "Here's a roomful of passionate people, and the GYC is telling us to be polite."

GYC Executive Director Caroline Byrd suggested people who write comment letters on the proposal focus their remarks on the project at hand because focused remarks are more effective.

The public comment period is open until July 15.

Comments on the proposal should be submitted by July 15 to Peter Werner, Project Lead, Custer Gallatin National Forest Supervisor's Office, 10 E. Babcock, Bozeman, MT 59715 or by email at FS-comments-northern-gallatin@fs.fed.us. All comments received, including names and addresses of those who comment, will be part of the public record and will be available for public inspection, a Forest Service news release stated.

For more information, contact Werner at 587-6962.

THE LIVINGSTON ENTERPRISE

OPINION Friday, July 10, 2015

EDITORIAL

There's a place for mines, and it's not on Emigrant Peak

Federal officials must be diligent in their review of a Canadian company's proposed mine exploration project on the flanks of Emigrant Peak in Paradise Valley.

The project, proposed by Lucky Minerals, would include drilling 45 bore holes on the doorstep of Yellowstone National Park.

Pending the outcome of the exploratory process, the project could eventually evolve into a full-scale mining operation. That not only raises many concerns about impacts to watersheds and the environment, but is also out of character for Paradise Valley.

Park County residents are already taking a stand against the proposal, first reported in June in The Livingston Enterprise, and are hoping to slow down the process with the goal of a thorough review by the U.S. Forest Service.

More than 100 people turned out Thursday for a public meeting on the matter at the Elks Lodge in Livingston. A reporter from this newspaper couldn't find a single person in the audience to interview who supported the project.

Even in a community where many residents earn their paychecks from the Stillwater Mine, the proposal from Lucky Minerals isn't a good fit for Park County.

Aside from the possible environmental concerns, Lucky Minerals and the Forest Service must consider the potential impacts on the community and businesses such as Chico Hot Springs Resort.

Access to the company's proposed drill sites passes directly through Chico en route to Emigrant Creek.

Chico's new owner, Colin Davis, said in a Thursday Enterprise article that the proposal isn't in the best interest of the Emigrant area.

Davis added that mine traffic would pass within 12 feet of the front doors of his world-class resort, among the top employers in Park County.

Already, people are drawing comparisons between the Berkeley Pit in Butte and the long-term potential for the Emigrant Peak project to become an open-pit mine.

The proposal from Lucky Minerals could lead to a future mining operation stretching across more than 2,560 acres of Emigrant Peak, according to the Greater Yellowstone Coalition.

As we have learned from a long, sordid history of mining in Montana, we must be selective and critical in determining where companies are given the green light for resource extraction.

A Canadian company might have the legal right to pursue this project in Paradise Valley, but that doesn't mean it's a good fit for Chico Hot Springs, Paradise Valley and Park County.

Emigrant Peak is the ideal location for many activities, but a mine exploration project isn't one of them.

The July 15 deadline to submit public comments on the Lucky Minerals proposal is fast approaching, and Park County residents are encouraged to weigh in now.

Comments should be submitted to Peter Werner, project lead, Custer National Forest Supervisor's Office, 10 E. Babcock St., Bozeman, MT 59715. Comments may also be submitted by email to FS-comments-northern-gallatin@fs.fed.us.

— Justin Post
Enterprise Managing Editor

THE LIVINGSTON ENTERPRISE

Thursday, July 9, 2015 * Livingston, Montana * Vol. 105 No. 194

Emigrant mine plan raising questions, concerns

By Liz Kearney
Enterprise Staff Writer

Local environmentalists will host a repeat of last week's Emigrant mine exploration proposal meeting in Livingston tonight.

Lucky Minerals of Canada has proposed to dig exploratory drill holes on unpatented mining claims in the Custer Gallatin National Forest on the flanks of Emigrant Peak. The company is exploring for gold, along with silver, copper and molybdenum.

Forest Service officials announced the plan in early June. Forest supervisors are accepting public comments on the proposal until July 15.

Tonight's meeting will take place at 6 p.m. at the Livingston Elks Lodge, located at 130 S. Second St.

The proposed bore holes would be drilled along Emigrant Creek, southeast of Emigrant. The proposal includes 12 bore sites on federal land and 23 on private land. The bore pits could lead to a full-fledged mining operation across more than 2,560 acres in Emigrant Gulch, according to information GYC Waters Program Coordinator Joe Josephson presented at the Emigrant meeting. For comparison, Josephson noted that the Berkeley Pit in Butte is about 800 acres.

The first phase of drilling could start later this summer. The road to access the sites passes through the Chico Hot Springs Resort on its way up Emigrant Creek.

Chico Hot Springs Resort owner Colin Davis feels strongly the mine proposal is not in the best interest of the Emigrant area. He has numerous concerns about increased truck traffic on U.S. Highway 89, the potential for contaminating both hot and cold water streams, and the mining traffic that could roll past his hotel's front doors.

"It's within 12 feet of the lobby doors," Davis said Thursday, adding later about his guests, "They don't expect to be camping on the edge of the Berkeley Pit."

The Park County Environmental Council lists on its website its areas of concern about the proposal, including endangered species impacts, water quality, contamination from spills and discharges, recreation and public access issues, and wildfire danger. PCEC is encouraging its members and the public to share these concerns with the Forest Service during its comment period and to forward their letters to the Montana Department of Environmental Quality's Hard Rock Mining Bureau Chief, Warren McCullough.

At a public meeting in Emigrant held June 30, nearly 100 people turned out to hear Greater Yellowstone Coalition staffers explain what the company proposes based on the company's 82-page technical report on the Emigrant Peak site.

PCEC is calling for state and federal agencies to carefully evaluate the impacts of the Lucky Minerals proposal.

Lucky Minerals' full report is available online at www.luckyminerals.com.

Project information, including the Emigrant Project Mineral Exploration Plan of Operations, is available online at www.fs.usda.gov/custergallatin by clicking on the right-hand quicklink NEPA and Public Scoping Documents.

Comments to the DEQ may be directed to Warren McCullough at the Montana Department of Environmental Quality, P.O. Box 200901, Helena, MT 59620-0901; or by email to wmccullough@mt.gov. Include a reference to the Emigrant-Lucky Minerals Exploratory Drilling Proposal.

Comments on the proposal should be submitted by July 15 to Peter Werner, Project Lead, Custer Gallatin National Forest Supervisors Office, 10 E. Babcock, Bozeman, MT 59715 or by email at FS-comments-northern-gallatin@fs.fed.us. All comments received, including names and addresses of those who comment, will be part of the public record and will be available for public inspection, a Forest Service news release stated.

For more information, contact Werner at 587-6962.

THE LIVINGSTON ENTERPRISE

Wednesday, July 1, 2015 * Livingston, Montana * Vol. 105 No. 188

Groups discuss, express concerns on proposed mine exploration

By Liz Kearney
Enterprise Staff Writer

A Canadian mining company's proposal to drill exploratory bore holes on a 2,500-acre parcel on the flanks of Emigrant Peak was presented in detail along with maps and aerial photos of the proposed drill sites to nearly 100 area residents who attended a public meeting in Emigrant Tuesday night.

Lucky Minerals, a Canadian mining exploration company, proposed to the Custer Gallatin National Forest to drill bore holes on 12 mining claims along Emigrant Creek in the forest. Forest Service officials announced the proposal on June 2. Officials will accept public comments on the plan until July 15.

Conservation leaders who led the meeting, including former water and mining experts now employed by the Greater Yellowstone Coalition, informed meeting attendees about the project. They said public comments made now will have an impact how much study — up to and possibly including an environmental impact statement — the proposal will receive in the future. They encouraged everyone in attendance to comment to the Forest Service on the proposal.

There were no representatives of Lucky Minerals at Tuesday's meeting. Shaun Dykes, a company vice president said in an email to The Enterprise the project could take years to develop any mining, depending on the findings from the bore holes.

Joe Josephson, the GYC's Montana conservation associate, said the company's proposal looks "more complicated" than the scoping notice published June 2.

Josephson noted that Lucky Minerals is seeking a "categorical exclusion" under the National Environmental Protection Act. A categorical exclusion, according to a NEPA definition, is a collection of actions that do not have a significant effect on the human environment. Categorical exclusions are allowed unless there are "extraordinary circumstances." The conservation groups believe the Emigrant Peak area's pristine environment, clean water and endangered grizzly bear habitat all constitute "extraordinary circumstances."

Josephson's concern, along with GYC Waters Program Coordinator Bob Zimmer, is that the cumulative effect of the bore hole work — along with any subsequent mining operations, which are not part of the current proposal — could create risks to streamflows,

underground aquifers that drain to the Yellowstone River, overall water quality, scenic values, public access to recreation, and grizzly bear habitat.

Carolyn Byrd, GYC's executive director, pointed out that under the 1872 Mining Law, the Forest Service is mandated to assist with mining proposals, and emphasized nothing illegal is being proposed.

An area resident at the meeting pointed out that the Stillwater Mine operates along the Stillwater River, a popular fly-fishing destination, suggesting that mining can co-exist with outdoor recreation and clean water.

Project information, including the Emigrant Project Mineral Exploration Plan of Operations, is available online at www.fsusda.gov/custergallatin by clicking on the right-hand quicklink NEPA and Public Scoping Documents.

Comments on the proposal should be submitted by July 15 to Peter Werner, Project Lead, Custer Gallatin National Forest Supervisors Office, 10 E. Babcock, Bozeman, MT 59715 or by email at FS-comments-northern-gallatin@fs.fed.us. All comments received, including names and addresses of those who comment, will be part of the public record and will be available for public inspection, a Forest Service news release stated.

For more information, contact Werner at 587-6962.

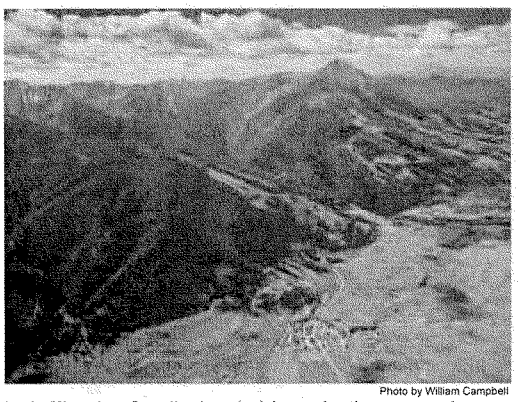


Photo by William Campbell

Lucky Minerals, a Canadian-based mining exploration company, is proposing to drill bore holes in the Emigrant Creek drainage. The mining claims area is above and to the left of Chico Hot Springs, which is seen at the bottom of this photo taken June 26.

A Profile of Socioeconomic Measures

Selected Geographies:

Park County, MT

Benchmark Geographies:

U.S.

Produced by
Economic Profile System
EPS
July 25, 2017

About the Economic Profile System (EPS)

EPS is a free, easy-to-use software application that produces detailed socioeconomic reports of counties, states, and regions, including custom aggregations.

EPS uses published statistics from federal data sources, including Bureau of Economic Analysis and Bureau of the Census, U.S. Department of Commerce; and Bureau of Labor Statistics, U.S. Department of Labor.

The Bureau of Land Management and Forest Service have made significant financial and intellectual contributions to the operation and content of EPS.

See headwaterseconomics.org/EPS for more information about the other tools and capabilities of EPS.

For technical questions, contact Patty Gude at eps@headwaterseconomics.org, or 406-599-7425.

HEADWATERS ECONOMICS

headwaterseconomics.org

Headwaters Economics is an independent, nonprofit research group. Our mission is to improve community development and land management decisions in the West.

www.blm.gov

The Bureau of Land Management, an agency within the U.S. Department of the Interior, administers 249.8 million acres of America's public lands, located primarily in 12 Western States. It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

www.fs.fed.us

The Forest Service, an agency of the U.S. Department of Agriculture, administers national forests and grasslands encompassing 193 million acres. The Forest Service's mission is to achieve quality land management under the "sustainable multiple-use management concept" to meet the diverse needs of people while protecting the resource. Significant intellectual, conceptual, and content contributions were provided by the following individuals: Dr. Pat Reed, Dr. Jessica Montag, Doug Smith, M.S., Fred Clark, M.S., Dr. Susan A. Winter, and Dr. Ashley Goldhor-Wilcock.

Table of Contents

	Page
Trends	
How have population, employment, and personal income changed?	1
Components	
How have the components of population changed?	2
How have the components of employment changed?	3
How has the mix of wage and salary and proprietors income changed?	4
How has the mix of labor earnings and non-labor income changed?	5
Industry Sectors	
How has employment by industry changed historically?	6
How has employment by industry changed recently?	7
How has earnings by industry changed historically?	8
How has earnings by industry changed recently?	9
Performance	
How have earnings per job and per capita income changed?	10
How do wages compare across industries?	11
How has the unemployment rate changed?	12
What are the commuting patterns in the region?	13
Do national recessions affect local employment?	14
Benchmarks	
How does performance compare to the benchmark?	15-16
Data Sources & Methods	17
Links to Additional Resources	18

Note to Users:

This is one of fourteen reports that can be created and downloaded from EPS Web. You may want to run another EPS report for either a different geography or topic. Topics include land use, demographics, specific industry sectors, the role of non-labor income, the wildland-urban interface, the role of amenities in economic development, and payments to county governments from federal lands. Throughout the reports, references to online resources are indicated in parentheses. These resources are provided as hyperlinks on each report's final page. The EPS reports are downloadable as Excel, PDF, and Word documents. For further information and to download reports, go to:
headwaterseconomics.org/eps

Park County, MT

Trends

How have population, employment, and personal income changed?

This page describes trends in population, employment, and real personal income. If this report is for an individual county, it also shows the county classification (metropolitan, micropolitan, or rural).

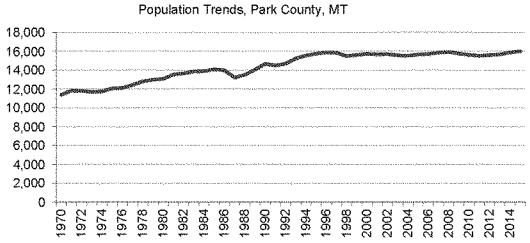
According to the U.S. Census Bureau, Park County, MT is designated as a Rural.

Total Population, Employment, & Real Personal Income Trends, 1970-2015

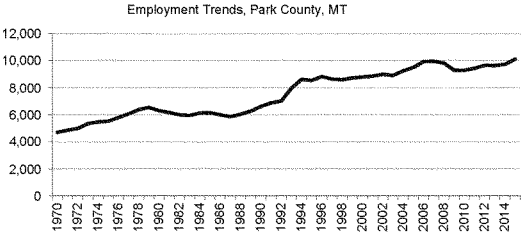
	1970	1980	1990	2000	2015	Change 2000-2015
Population	11,365	13,056	14,643	15,710	15,972	262
Employment (full & part-time jobs)	4,692	6,287	6,598	8,777	10,097	1,320
Personal Income (thousands of 2016$s)	237,138	334,462	348,837	464,636	713,624	248,988

Population and personal income are reported by place of residence, and employment by place of work on this page.

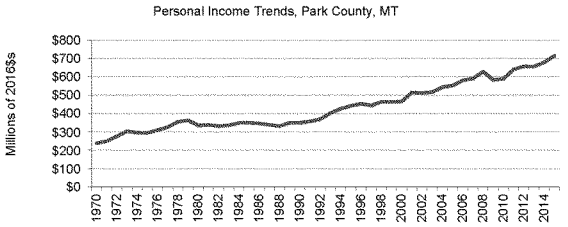
- From 1970 to 2015, population grew from 11,365 to 15,972 people, a 41% increase.



- From 1970 to 2015, employment grew from 4,692 to 10,097, a 115% increase.



- From 1970 to 2015, personal income grew from $237.1 million to $713.6 million, (in real terms), a 201% increase.



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Study Guide and Supplemental Information

How have population, employment, and personal income changed?

What do we measure on this page?

This page describes trends in population, employment, and real personal income. If this report is for an individual county, it also shows the county (urban-rural) classification.

Population: The total number of people by place of residence.

Employment: All full and part-time workers, wage and salary jobs (employees), and proprietors (the self-employed) reported by place of work.

Personal Income: Income from wage and salary employment and proprietors' income (labor earnings), as well as non-labor income (dividends, interest, and rent, and transfer payments) reported by place of residence. All income figures in this report are shown in real terms (i.e., adjusted for inflation). Subsequent sections of this report define labor earnings and non-labor income in more detail.

Metropolitan Statistical Areas: Counties that have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Metropolitan Statistical Areas are classified as either Central or Outlying.

Micropolitan Statistical Areas: Counties that have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan Statistical Areas are classified as either Central or Outlying.

Rural: Counties that are not designated as either Metropolitan or Micropolitan.

Why is it important?

Long-term, steady growth of population, employment, and real personal income is generally an indication of a healthy, prosperous economy. Erratic growth, no-growth, or long-term decline in these indicators are generally an indication of a struggling economy.

Growth can benefit the general population of a place, especially by providing economic opportunities, but it can also stress communities, and lead to income stratification. When considering the benefits of growth, it is important to distinguish between standard of living (such as earnings per job and per capita income) and quality of life (such as leisure time, crime rate, and sense of well-being).

A related indicator of economic performance is whether the local economy is negatively affected by periods of national recession. This issue is explored in depth in the section "Do national recessions affect local employment?" later in this report.

The size of a population and economy (metropolitan, micropolitan, and rural) can have an important bearing on the types of economic activities present as well as opportunities and challenges for area businesses.

Additional Resources

In addition to U.S. Census Bureau county classifications offered here, a number of other county classification systems are available:

The Bureau of Economic Analysis offers a way to classify all counties in the country into "BEA Economic Areas." These are counties clustered around "nodes" of metropolitan or micropolitan areas. Maps of BEA Economic Areas can be seen at: bea.gov/regional/docs/econlist.cfm *(1)*; the methods are available at: bea.gov/SCB/PDF/2004/11November/1104Econ-Areas.pdf *(2)*.

The Economic Research Service of the U.S. Department of Agriculture offers a county classification system based on economic dependence on particular sectors (for example, "Farming-dependent," Mining-dependent"), economic activity ("Non-metro recreation"), and by policy type (for example, "Housing-stress," and "Persistent poverty"). Economic Research Service codes can be found at: ers.usda.gov/Briefing/Rurality/Typology *(3)*. This web site also offers an alternative definition in the form of "Rural-Urban Continuum Codes."

Headwaters Economics has developed a "Three Wests" county typology for all counties in the 11 contiguous western U.S. states based on access to markets via highway or air travel. The following web site offers maps, a journal article on the subject, and an interactive tool that allows the user to compare a county to custom selected peers or benchmark; see: headwaterseconomics.org/3wests.php *(4)*.

Data Sources

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Park County, MT

Components

How have the components of population changed?

This page describes various components of population change and total population growth (or decline). Total population growth (or decline) is the sum of natural change (births & deaths) and migration (international & domestic).

Components of Population Growth, 2000-2016

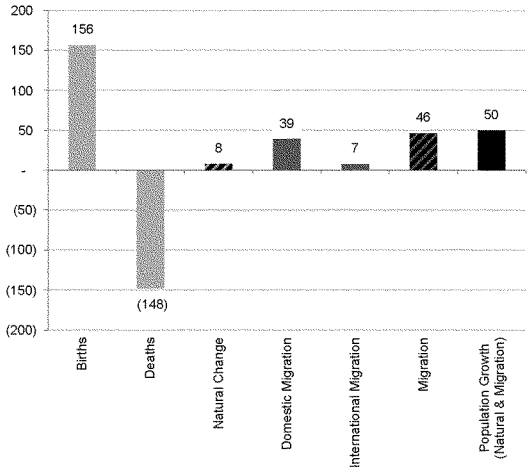
	Change 2000-2016
Population Growth, 2000-2016	395
Avg. Annual Population Change (Natural Change & Net Migration)	50
Avg. Annual Natural Change (Births & Deaths)	8
Avg. Annual Births	156
Avg. Annual Deaths	148
Avg. Annual Net Migration (International & Domestic)	46
Avg. Annual International Migration	7
Avg. Annual Domestic Migration	39
Avg. Annual Residual	-5

Percent of Population Growth, 2000-2016

Avg. Annual Natural Change (Births & Deaths)	16.1%
Avg. Annual Net Migration (International & Domestic)	93.0%

- From 2000 to 2016, population grew by 395 people, a 3% increase.
- From 2000 to 2016, natural change contributed to 16% of population growth.
- From 2000 to 2016, migration contributed to 93% of population growth.

Average Annual Components of Population Change, Park County, MT, 2000-2016



* The Census Bureau makes a minor statistical correction, called a "residual" which is shown in the table above, but omitted from the figure. Because of this correction, natural change plus net migration may not add to total population change in the figure.

Data Sources: U.S. Department of Commerce. 2017. Census Bureau, Population Division, Washington, D.C.

Study Guide and Supplemental Information

How have the components of population changed?

What do we measure on this page?

This page describes various components of population change and total population growth (or decline). Total population growth (or decline) is the sum of natural change (births & deaths) and migration (international & domestic).

Why is it important?

It is useful to understand the components of population change because it offers insight into the causes of growth or decline and it helps highlight important areas of inquiry. For example, if a large portion of population growth is from in-migration, it would be helpful to understand what the drivers are behind this trend, including whether people are moving to the area for jobs, quality of life, or both. If a large portion of population decline is from out-migration, it would similarly be important to understand the reasons, including the loss of employment in specific industries, youth leaving for education or new opportunities, and elderly people leaving for better medical facilities.

Methods

The Bureau of the Census makes a minor statistical correction, called a "residual." This is defined by the Bureau of the Census as resulting from "two parts of the estimates process: 1) the application of national population controls to state and county population estimates and 2) the incorporation of accepted challenges and special censuses into the population estimates. The residual represents change in the population that cannot be attributed to any specific demographic component of population change."

Additional Resources

For a glossary of terms used by the U.S. Census Bureau, see: census.gov/popest/about/terms.html *(5)*.

For methods used by the U.S. Census Bureau, see: census.gov/popest/methodology/index.html *(6)*.

For terms used by the U.S. Census Bureau, see: census.gov/popest/about/terms.html *(5)*.

For more information on demographics, see the EPS Demographics report.

Data Sources

U.S. Department of Commerce. 2017. Census Bureau, Population Division, Washington, D.C.

Park County, MT

Components

How have the components of employment changed?

This page describes changes in two components of employment: wage and salary jobs, and proprietor jobs.

Wage and Salary: This is a measure of the average annual number of full-time and part-time jobs by place of work. All jobs for which wages and salaries are paid are counted. Full-time and part-time jobs are counted with equal weight.

Proprietors: This term includes the self-employed in farm and nonfarm sectors by place of work. Nonfarm self-employment consists of the number of sole proprietorships and the number of individual business partners not assumed to be limited partners. Farm self-employment is defined as the number of non-corporate farm operators, consisting of sole proprietors and partners.

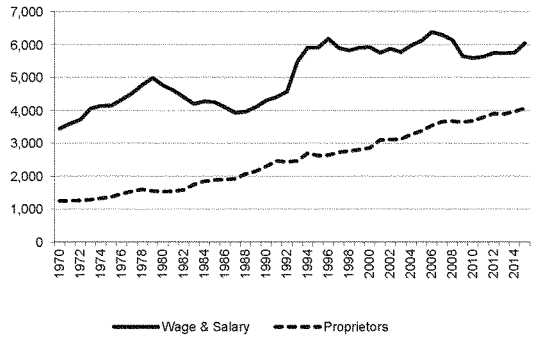
Components of Employment Change, 1970-2015

	1970	1980	1990	2000	2015	Change 2000-2015
Total Employment	4,692	6,287	6,598	8,777	10,097	1,320
Wage and salary jobs	3,444	4,759	4,299	5,919	6,036	117
Number of proprietors	1,248	1,528	2,299	2,858	4,061	1,203
Percent of Total						% Change 2000-2015
Total Employment						15.0%
Wage and salary jobs	73.4%	75.7%	65.2%	67.4%	59.8%	2.0%
Number of proprietors	26.6%	24.3%	34.8%	32.6%	40.2%	42.1%

All employment data in the table above are reported by *place of work*. Includes full-time and part-time workers.

- From 1970 to 2015, wage and salary employment (people who work for someone else) grew from 3,444 to 6,036, a 75% increase.
- From 1970 to 2015, proprietors (the self-employed) grew from 1,248 to 4,061, a 225% increase.

Components of Employment, Park County, MT



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Study Guide and Supplemental Information

How have the components of employment changed?

What do we measure on this page?

This page describes the changes in two components of employment: wage and salary employment, and proprietors.

Wage and Salary: This is a measure of the average annual number of full-time and part-time jobs by place of work. All jobs for which wages and salaries are paid are counted. Full-time and part-time jobs are counted with equal weight.

Proprietors: This term includes the self-employed in nonfarm and farm sectors by place of work. Nonfarm self-employment consists of the number of sole proprietorships and the number of individual business partners not assumed to be limited partners. Farm self-employment is defined as the number of non-corporate farm operators, consisting of sole proprietors and partners.

Why is it important?

A high level of growth in proprietors' employment could be interpreted as a sign of entrepreneurial activity, which is a positive indicator of economic health. However, in some areas, particularly in remote rural areas, it is possible that a high proportion of self-employed is an indication that there are few jobs available. People may work for themselves because it is the only alternative and they may work for themselves in addition to holding a wage and salary job.

One way to see whether growth and a high-level of proprietors' employment is a positive sign for the local economy is to look at the long-term trends in proprietors' personal income. If proprietors' employment and real personal income are both rising, this is a healthy indicator of entrepreneurial activity. If, on the other hand, proprietors' employment is rising and real personal income is falling, this can be a sign of economic stress. The following section of this report examines this relationship.

Methods

For details on how the Bureau of Economic Analysis defines proprietors' employment, see: bea.gov/regional/definitions/nextpage.cfm?key=Proprietors%20employment *(7)*.

Additional Resources

For a glossary of terms used by the Bureau of Economic Analysis, see: bea.gov/glossary/glossary.cfm *(8)*.

For an example of an academic study where proprietors' employment is considered an indication of entrepreneurial activity, see: Mack, E., T.H. Grubesic and E. Kessler. 2007. "Indices of Industrial Diversity and Regional Economic Composition." Growth and Change. 38(3): 474-509.

For more information on farm employment and earnings, see the EPS Agriculture report.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30

Park County, MT

Components

How has the mix of wage and salary and proprietors income changed?

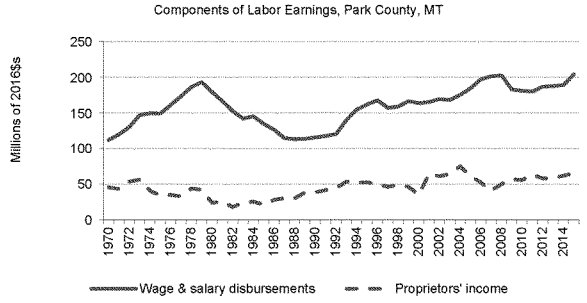
This page describes the components of labor earnings (in real terms): income from wage and salary, and proprietors' employment. It also looks more closely at proprietors, comparing long-term trends in proprietors' employment and personal income.

Components of Labor Earnings Change, 1970-2015 (Thousands of 2016 $s)

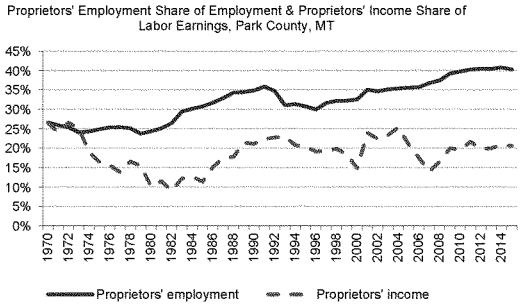
	1970	1980	1990	2000	2015	Change 2000-2015
Earnings by place of work	172,771	237,555	183,323	239,081	319,297	80,216
Wage & salary disbursements	112,069	179,406	115,696	163,533	203,984	40,451
Supplements to wages & salaries	14,879	34,073	28,951	40,054	49,662	9,608
Proprietors' income	45,823	24,076	38,676	35,494	65,651	30,157
Percent of Total						% Change 2000-2015
Earnings by place of work						33.6%
Wage & salary disbursements	64.9%	75.5%	63.1%	68.4%	63.9%	24.7%
Supplements to wages & salaries	8.6%	14.3%	15.8%	16.8%	15.6%	24.0%
Proprietors' income	26.5%	10.1%	21.1%	14.8%	20.6%	85.0%

All income data in the table above are reported by *place of work*, which is different than earnings by *place of residence* shown on the following page of this report.

- From 1970 to 2015, labor earnings from wage and salary employment grew from $112.1 million to $204.0 million (in real terms), a 82% increase.
- From 1970 to 2015, labor earnings from proprietors' employment grew from $45.8 million to $65.7 million (in real terms), a 43% increase.



- In 1970, proprietors represented 27% of total employment. By 2015, proprietors represented 40% of total employment.
- In 1970, proprietors represented 27% of total labor earnings. By 2015, proprietors represented 21% of total labor earnings.



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Study Guide and Supplemental Information

How has the mix of wage and salary and proprietors income changed?

What do we measure on this page?

This page describes the components of labor earnings (in real terms): income from wage and salary, and proprietors' employment. It also looks more closely at proprietors, comparing long-term trends in proprietors' employment and personal income.

Labor Earnings: This represents (on this page) net earnings by place of work.

Wage and Salary: This is a measure of the average annual number of full-time and part-time jobs in each area by place of work. All jobs for which wages and salaries are paid are counted. Full-time and part-time jobs are counted with equal weight.

Proprietors: This term includes the self-employed in nonfarm and farm sectors. Nonfarm self-employment consists of the number of sole proprietorships and the number of individual business partners not assumed to be limited partners. Farm self-employment is defined as the number of non-corporate farm operators, consisting of sole proprietors and partners.

Why is it important?

The table and figures can be used to compare the relative importance, and change in importance, of wage and salary jobs and proprietors as a source of employment and earnings.

Rapid growth and/or high proportions of proprietors' employment and income can be a sign of a healthy economy that is attracting entrepreneurs and stimulating business development. Correlating this growth here with patterns of population growth (such as high levels of in-migration) and unemployment rates (robust business development activity tends to be associated with lower rates of unemployment) may support this finding. High levels of proprietors in an economy can also indicate a weak labor force and a lack of opportunity. This may be the case if proprietors' employment is increasing and labor earnings as a whole are flat or declining.

Additional Resources

Labor Earnings is the same as Net Earnings by Place of Work, as defined by the U.S. Department of Commerce. For a glossary of terms used by the Bureau of Economic Analysis, see: bea.gov/regional/definitions *(9)*.

For more information on farm employment and earnings, see the EPS Agriculture report.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA30.

Park County, MT

Components

How has the mix of labor earnings and non-labor income changed?

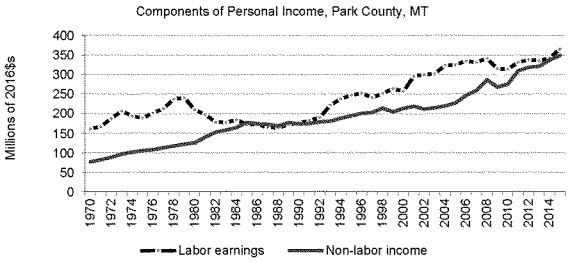
This page describes changes in labor earnings and non-labor sources of income.

Components of Personal Income Change, 1970-2015 (Thousands of 2016 $s)

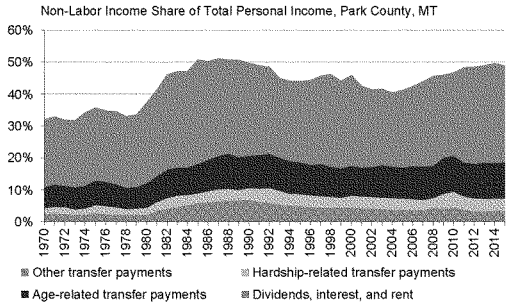
	1970	1980	1990	2000	2015	Change 2000-2015
Total Personal Income	237,138	334,462	348,837	464,636	713,624	248,988
Labor Earnings	160,833	209,485	175,527	256,754	364,889	108,135
Non-Labor Income	76,304	124,976	173,310	213,044	348,735	135,691
Dividends, Interest, and Rent	50,489	84,503	101,428	131,797	216,678	84,881
Age-Related Transfer Payments	15,503	25,899	35,267	43,359	80,442	37,083
Hardship-Related Transfer Payments	4,504	7,446	12,997	17,247	27,530	10,283
Other Transfer Payments	5,505	7,000	23,618	20,641	24,085	3,444
Percent of Total						% Change 2000-2015
Total Personal Income						53.6%
Labor Earnings	67.8%	62.6%	50.3%	55.3%	51.1%	42.1%
Non-Labor Income	32.2%	37.4%	49.7%	45.9%	48.9%	63.7%
Dividends, Interest, and Rent	21.3%	25.3%	29.1%	28.4%	30.4%	64.4%
Age-Related Transfer Payments	6.5%	7.7%	10.1%	9.3%	11.3%	85.5%
Hardship-Related Transfer Payments	1.9%	2.2%	3.7%	3.7%	3.9%	59.6%
Other Transfer Payments	2.3%	2.1%	6.8%	4.4%	3.4%	16.7%

All income data in the table above are reported by *place of residence*. Labor earnings and non-labor income may not add to total personal income due to adjustments made by the Bureau of Economic Analysis.

- From 1970 to 2015, labor earnings grew from $160.8 million to $364.9 million (in real terms), a 127% increase.
- From 1970 to 2015, non-labor income grew from $76.3 million to $348.7 million (in real terms), a 357% increase.



- From 1970 to 2015, labor earnings accounted for 43% of growth and non-labor income for 57%.
- In 1970, non-labor income represented 32% of total personal income. By 2015 non-labor income represented 49% of total personal income.



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA05, CA05N & CA35.

How has the mix of labor earnings and non-labor income changed?

What do we measure on this page?

This page describes changes in labor earnings and non-labor sources of income.

Labor Earnings: This represents net earnings by place of residence, which is earnings by place of work (the sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income) less contributions for government social insurance, plus an adjustment to convert earnings by place of work to a place of residence basis.

Non-Labor Income: Dividends, interest, and rent (money earned from investments), and transfer payments (includes government retirement and disability insurance benefits, medical payments such as mainly Medicare and Medicaid, income maintenance benefits, unemployment insurance benefits, etc.) make up non-labor income. Non-labor income is reported by place of residence.

Dividends, Interest, and Rent: This includes personal dividend income, personal interest income, and rental income of persons with capital consumption adjustment that are sometimes referred to as "investment income" or "property income."

Age-Related Transfer Payments: This measures payments associated with older populations, including Social Security and Medicare.

Hardship-Related Transfer Payments: Payments associated with poverty and welfare, including Medicaid and income maintenance.

Other Transfer Payments: Payments from veteran's benefits, education and training, Workers' Compensation insurance, railroad retirement and disability, other government retirement and disability, and other receipts of individuals and non-profits.

Why is it important?

In many geographies non-labor income is often the largest source of personal income and also the fastest growing. This is particularly the case in some rural areas and small cities. An aging population, stock market and investment growth, and a highly mobile population are some of the reasons behind the rapid growth in non-labor income.

The growth in non-labor income can be an indication that a place is an attractive place to live and retire. The in-migration of people who bring investment and retirement income with them (verify from previous pages that in-migration is increasing) is associated with a high quality of life (for example, local recreation opportunities), good health care facilities, and affordable housing (important for those on a fixed income). Non-labor income can also be important to places with struggling economies, either as a source of income maintenance for the poor or as a more stable form of income in areas with declining industries and labor markets.

When investigating non-labor income some important issues for public land managers include whether the area is attracting retirees and people with investment income, the role public lands play in attracting and retaining people with non-labor income, how these people use or enjoy public lands, and whether these uses or ways of enjoying public lands are at odds with current uses or management.

If public lands resources are one of the reasons growing areas are able to attract and retain non-labor sources of income, then public lands are important to local economic well-being by contributing to economic growth and per capita income. If, on the other hand, contracting populations or industries result in a shrinking labor market, non-labor income may be important as a remaining source of income and can help stabilize downturns.

Methods

The term "labor" is used in this report to differentiate labor from non-labor sources of income. As defined by the U.S. Department of Commerce, labor earnings are "net earnings by place of residence." For a glossary of terms used by the Bureau of Economic Analysis, see: bea.gov/regional/definitions *(9)*.

Labor earnings and non-labor income may not add to total personal income because of adjustments made by the Bureau of Economic Analysis to account for contributions for social security, cross-county commuting, and other factors.

Additional Resources

For detailed analysis of non-labor income and its components, see the EPS Non-Labor Income report.
For more information on the aging of the population and poverty measures, see the EPS Demographics report.
For a glossary of terms used by the Bureau of Economic Analysis, see: bea.gov/glossary/glossary.cfm *(8)*. Note that the term "non-labor" income is not used by BEA, It is used here to refer to the sum of non-labor related sources of personal income.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA05 & CA05N.

Park County, MT

How has employment by industry changed historically?

This page describes historical employment change by industry. Industries are organized according to three major categories: non-services related, services related, and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Employment by Industry, 1970-2000

	1970	1980	1990	2000	Change 1990-2000
Total Employment (number of jobs)	4,692	6,287	6,598	8,777	2,179
Non-Services Related	~1,133	1,316	1,484	2,085	601
Farm	630	523	505	631	126
Agricultural services, forestry, fishing & other	47	71	125	248	123
Mining (including fossil fuels)	~5	14	128	30	-98
Construction	156	294	379	726	347
Manufacturing (incl. forest products)	295	414	347	450	103
Services Related	3,008	4,300	4,365	5,869	1,504
Transportation & public utilities	744	1,371	322	355	33
Wholesale trade	37	55	132	207	75
Retail trade	872	1,052	1,236	1,802	566
Finance, insurance & real estate	357	409	461	591	130
Services	998	1,413	2,214	2,914	700
Government	555	671	749	823	74
Percent of Total					% Change 1990-2000
Total Employment					33.0%
Non-Services Related	~24.1%	20.9%	22.5%	23.8%	40.5%
Farm	13.4%	8.3%	7.7%	7.2%	25.0%
Agricultural services, forestry, fishing & other	1.0%	1.1%	1.9%	2.8%	98.4%
Mining (including fossil fuels)	~0.1%	0.2%	1.9%	0.3%	-76.6%
Construction	3.3%	4.7%	5.7%	8.3%	91.6%
Manufacturing (incl. forest products)	6.3%	6.6%	5.3%	5.1%	29.7%
Services Related	64.1%	68.4%	66.2%	66.9%	34.5%
Transportation & public utilities	15.9%	21.8%	4.9%	4.0%	10.2%
Wholesale trade	0.8%	0.9%	2.0%	2.4%	56.8%
Retail trade	18.6%	16.7%	18.7%	20.5%	45.8%
Finance, insurance & real estate	7.6%	6.5%	7.0%	6.7%	28.2%
Services	21.3%	22.5%	33.6%	33.2%	31.6%
Government	11.8%	10.7%	11.4%	9.4%	9.9%

All employment data are reported by *place of work*. Estimates for data that were not disclosed are indicated with tildes (~).

The employment data above are organized according to the Standard Industrial Classification (SIC) system. The data end in 2000 because in 2001 the Bureau of Economic Analysis switched to organizing industry-level data according to the newer North American Industrial Classification System (NAICS). More recent employment trends, organized by NAICS, are shown in subsequent sections of this report.

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25.

Study Guide and Supplemental Information

How has employment by industry changed historically?

What do we measure on this page?

This page describes historical employment change by industry. Industries are organized according to three major categories: non-services related; services related; and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Understanding which industries are responsible for most jobs and which sectors are growing or declining is key to grasping the type of economy that exists, how it has changed over time, and evolving competitive strengths. Most new jobs created in the U.S. economy in the last thirty years have been in services related sectors, a category that includes a wide variety of high and low-wage occupations ranging from jobs in hotels and amusement parks to legal, health, business, and educational services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

In many small rural communities, government employment (e.g., the Forest Service and Bureau of Land Management) represents an important component of the economy. In others there have been important changes in employment in mining (which includes fossil fuel energy development), manufacturing (which includes lumber and wood products), and construction.

Methods

The data end in 2000 because in 2001 the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). More recent employment trends, organized by NAICS, are shown in subsequent sections of this report.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes see: bls.gov/bls/NAICS.htm *(10)*.

According to projections by the U.S. Department of Labor, from 2008 through 2018 "goods-producing" employment in the U.S. (mining, construction, and manufacturing) will not grow. By 2018, goods-producing sectors will account for 12.9 percent of all jobs, down from 14.2 percent in 2008. In contrast, "service-producing" sectors are expected to account for 96 percent of the growth in new jobs. The fastest growing are projected to be professional and business services, and health care and social assistance. See: Bartsch K. J. 2009. "The Employment Projections for 2008-18" Monthly Labor Review Online. 132(11): 3-10, available at: bls.gov/opub/mlr/2009/11 *(11)*. See also: bls.gov/opub/mlr/2012/01/art1full.pdf *(12)* for 2010-2020 projections.

For an overview of how historical changes in employment have affected rural America, see: Whitenar, L.A. and D.A. McGranahan. 2003. "Rural America: Opportunities and Challenges." Amber Waves. February, available at: ers.usda.gov/Amberwaves/Feb03/features/ruralamerica.htm *(13)*.

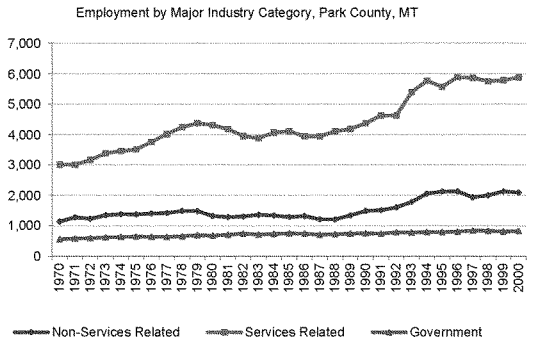
Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

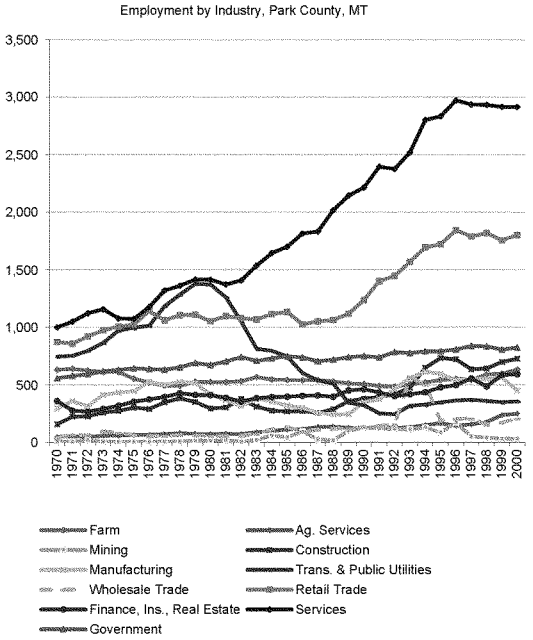
U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25.

Industry Sectors

- From 1970 to 2000, jobs in non-services related industries grew from 1,133 to 2,085, a 84% increase.
- From 1970 to 2000, jobs in services related industries grew from 3,008 to 5,869, a 95% increase.
- From 1970 to 2000, jobs in government grew from 555 to 823, a 48% increase.



- In 2000 the three industry sectors with the largest number of jobs were services (2,914 jobs), retail trade (1,802 jobs), and government (823 jobs).
- From 1970 to 2000, the three industry sectors that added the most new jobs were services (1,916 new jobs), retail trade (930 new jobs), and government (268 new jobs).



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25.

How has employment by industry changed historically?

What do we measure on this page?

This page describes historical employment change by industry. Industries are organized according to three major categories: non-services related; services related; and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Understanding which industries are responsible for most jobs and which sectors are growing or declining is key to grasping the type of economy that exists, how it has changed over time, and evolving competitive strengths. Most new jobs created in the U.S. economy in the last thirty years have been in services related sectors, a category that includes a wide variety of high and low-wage occupations ranging from jobs in hotels and amusement parks to legal, health, business, and educational services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

In many small rural communities, government employment (e.g., the Forest Service and Bureau of Land Management) represents an important component of the economy. In others there have been important changes in employment in mining (which includes fossil fuel energy development), manufacturing (which includes lumber and wood products), and construction.

Methods

The data end in 2000 because in 2001 the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). More recent employment trends, organized by NAICS, are shown in subsequent sections of this report.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes see: bls.gov/bls/NAICS.htm *(10)*.

According to projections by the U.S. Department of Labor, from 2008 through 2018 "goods-producing" employment in the U.S. (mining, construction, and manufacturing) will not grow. By 2018, goods-producing sectors will account for 12.9 percent of all jobs, down from 14.2 percent in 2008. In contrast, "service-producing" sectors are expected to account for 96 percent of the growth in new jobs. The fastest growing are projected to be professional and business services, and health care and social assistance. See: Bartsch K. J. 2009. "The Employment Projections for 2008-18" Monthly Labor Review Online. 132(11): 3-10, available at: bls.gov/opub/mlr/2009/11 *(11)*. See also: bls.gov/opub/mlr/2012/01/art1full.pdf *(12)* for 2010-2020 projections.

For an overview of how historical changes in employment have affected rural America, see: Whitenar, L.A. and D.A. McGranahan. 2003. "Rural America: Opportunities and Challenges." Amber Waves. February, available at: ers.usda.gov/Amberwaves/Feb03/features/ruralamerica.htm *(13)*.

Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25.

Park County, MT

How has employment by industry changed recently?

This page describes recent employment change by industry. Industries are organized according to three major categories: non-services related; services related; and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Employment by Industry, 2001-2015

	2001	2005	2010	2015	Change 2010-2015
Total Employment (number of jobs)	8,844	9,483	9,269	10,097	828
Non-services related	2,203	2,341	~2,008	2,245	~237
Farm	632	561	584	655	71
Forestry, fishing, & ag. services	206	203	~211	246	~35
Mining (including fossil fuels)	27	35	~50	53	~3
Construction	871	995	735	776	41
Manufacturing	467	547	428	515	87
Services related	~5,646	~5,962	~6,117	7,032	~915
Utilities	51	45	47	36	-11
Wholesale trade	107	69	87	132	45
Retail trade	1,084	1,096	929	998	69
Transportation and warehousing	228	188	186	191	5
Information	137	150	142	146	4
Finance and insurance	298	216	314	285	-29
Real estate and rental and leasing	332	412	521	591	70
Professional and technical services	402	483	503	527	24
Management of companies and enterprises	na	na	na	46	na
Administrative and waste services	na	na	na	278	na
Educational services	116	112	173	142	-31
Health care and social assistance	721	796	785	828	43
Arts, entertainment, and recreation	323	427	436	573	137
Accommodation and food services	1,270	1,346	1,348	1,533	185
Other services, except public administration	577	622	646	726	80
Government	825	859	822	820	-2

Percent of Total					% Change 2010-2015
Total Employment					8.9%
Non-services related	24.9%	24.7%	~21.7%	22.2%	~11.8%
Farm	7.1%	5.9%	6.3%	6.5%	12.2%
Forestry, fishing, & ag. services	2.3%	2.1%	~2.3%	2.4%	~16.6%
Mining (including fossil fuels)	0.3%	0.4%	~0.5%	0.5%	~6.0%
Construction	9.8%	10.5%	7.9%	7.7%	5.6%
Manufacturing	5.3%	5.8%	4.6%	5.1%	20.3%
Services related	~63.8%	~62.9%	~66.0%	69.6%	~15.0%
Utilities	0.6%	0.5%	0.5%	0.4%	-23.4%
Wholesale trade	1.2%	0.7%	0.9%	1.3%	51.7%
Retail trade	12.3%	11.6%	10.0%	9.9%	7.4%
Transportation and warehousing	2.6%	2.0%	2.0%	1.9%	2.7%
Information	1.5%	1.6%	1.5%	1.4%	2.8%
Finance and insurance	3.4%	2.3%	3.4%	2.8%	-9.2%
Real estate and rental and leasing	3.8%	4.3%	5.6%	5.9%	13.4%
Professional and technical services	4.5%	5.1%	5.4%	5.2%	4.8%
Management of companies and enterprises	na	na	na	0.5%	na
Administrative and waste services	na	na	na	2.8%	na
Educational services	1.3%	1.2%	1.9%	1.4%	-17.9%
Health care and social assistance	8.2%	8.4%	8.5%	8.2%	5.5%
Arts, entertainment, and recreation	3.7%	4.5%	4.7%	5.7%	31.4%
Accommodation and food services	14.4%	14.2%	14.5%	15.2%	13.7%
Other services, except public administration	6.5%	6.6%	7.0%	7.2%	12.4%
Government	9.3%	9.1%	8.9%	8.1%	-0.2%

All employment data are reported by *place of work*. Estimates for data that were not disclosed are indicated with tildes (~).

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25N.

Study Guide and Supplemental Information

How has employment by industry changed recently?

What do we measure on this page?

This page describes recent employment change by industry from 2001 to 2008. Industries are organized according to three major categories: non-services related, services related, and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Recent employment trends organized by NAICS offer more detail than the old Standard Industrial Classification (SIC) system, particularly with regard to services related industries. This is especially useful since in most geographies the majority of new job growth in recent years has taken place in services related industries.

Although NAICS captures much more detail on employment in services related sectors, these industries still encompass a wide variety of high and low-wage occupations ranging from jobs in accommodation and food services to professional and technical services. The section in this report titled "*How do wages compare across industries?*" shows the difference in wages between various services related industries and compared to non-services related sectors.

It can be useful to ask whether the historical employment trends shown earlier in this report continue more recently, and what factors are driving a shift in industry makeup and competitive position. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Methods

In 2001, the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). An advantage of the NAICS method is the greater amount of detail to describe changes in the service related sectors.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)*.

For a review of the role of public lands amenities and transportation in economic development, see:

Rasker, R., P.H. Gude, J.A. Gude, J. van den Noort. 2009. "The Economic Importance of Air Travel in High-Amenity Rural Areas." Journal of Rural Studies 25: 343-353., available at: headwaterseconomics.com/3wests/Rasker_et_al_2009_Three_Wests.pdf *(15)*.

For a review of the role of amenities in rural development, see the U.S. Department of Agriculture's Economic Research Service: McGranahan, D. 1999. "Natural Amenities Drive Rural Population Change." Agricultural Economic Report No. (AER781), October. ers.usda.gov/publications/aer-agricultural-economic-report/aer781.aspx *(16)*.

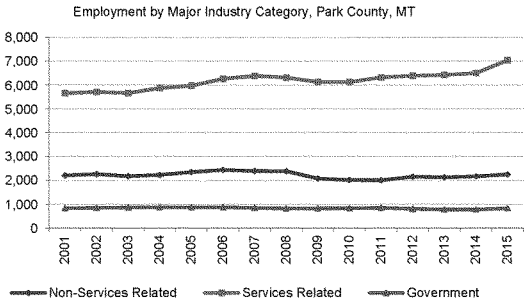
Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

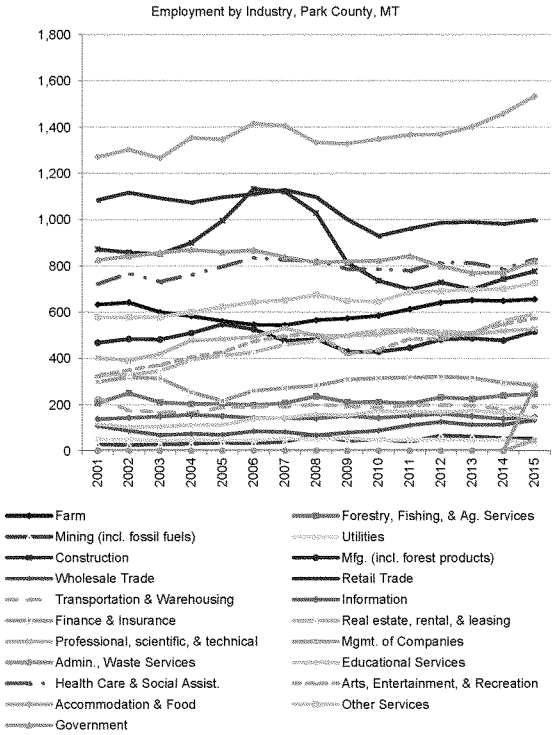
U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25N.

Industry Sectors

- From 2001 to 2015, jobs in non-services related industries grew from 2,203 to 2,245, a 2% increase.
- From 2001 to 2015, jobs in services related industries grew from 5,646 to 7,032, a 25% increase.
- From 2001 to 2015, jobs in government shrank from 825 to 820, a <1% decrease.



- In 2015 the three industry sectors with the largest number of jobs were accommodation and food services (1,533 jobs), retail trade (998 jobs), and health care and social assistance (828 jobs).
- From 2001 to 2015, the three industry sectors that added the most new jobs were accommodation and food services (263 new jobs), real estate and rental and leasing (259 new jobs), and arts, entertainment, and recreation (250 new jobs).



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25N.

How has employment by industry changed recently?

What do we measure on this page?

This page describes recent employment change by industry from 2001 to 2008. Industries are organized according to three major categories: non-services related, services related, and government. Employment includes wage and salary jobs and proprietors. The employment data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Recent employment trends organized by NAICS offer more detail than the old Standard Industrial Classification (SIC) system, particularly with regard to services related industries. This is especially useful since in most geographies the majority of new job growth in recent years has taken place in services related industries.

Although NAICS captures much more detail on employment in services related sectors, these industries still encompass a wide variety of high and low-wage occupations ranging from jobs in accommodation and food services to professional and technical services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

It can be useful to ask whether the historical employment trends shown earlier in this report continue more recently, and what factors are driving a shift in industry makeup and competitive position. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Methods

In 2001, the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). An advantage of the NAICS method is the greater amount of detail to describe changes in the service related sectors.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)*.

For a review of the role of public lands amenities and transportation in economic development, see:

Rasker, R., P.H. Gude, J.A. Gude, J. van den Noort. 2009. "The Economic Importance of Air Travel in High-Amenity Rural Areas." Journal of Rural Studies 25: 343-353., available at: headwaterseconomics.com/3wests/Rasker_et_al_2009_Three_Wests.pdf *(15)*.

For a review of the role of amenities in rural development, see the U.S. Department of Agriculture's Economic Research Service: McGranahan, D. 1999. "Natural Amenities Drive Rural Population Change." Agricultural Economic Report No. (AER781), October. ers.usda.gov/publications/aer-agricultural-economic-report/aer781.aspx *(16)*.

Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25N.

Park County, MT

How has earnings by industry changed historically?

This page describes historical change in earnings by industry (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The earnings data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Earnings by Industry, 1970-2000 (Thousands of 2016 $s)

	1970	1980	1990	2000	Change 1990-2000
Labor Earnings	$172,771	$237,555	$183,323	$244,223	$60,900
Non-Services Related	~$43,179	$35,693	$40,537	$44,169	$3,632
Farm	$24,648	$4,058	$5,566	-$2,381	-$7,947
Agricultural services, forestry, fishing & other	$772	$1,631	$1,707	$4,641	$2,934
Mining (including fossil fuels)	~$154	$1,806	$8,783	$2,296	-$6,487
Construction	$7,495	$11,256	$12,245	$22,530	$10,285
Manufacturing (incl. forest products)	$10,109	$16,942	$12,236	$17,083	$4,847
Services Related	$108,256	$174,215	$113,088	$163,276	$50,188
Transportation & public utilities	$50,229	$101,946	$18,658	$20,417	$1,759
Wholesale trade	$2,014	$2,499	$4,572	$6,428	$1,856
Retail trade	$22,436	$25,748	$28,033	$37,362	$9,329
Finance, insurance & real estate	$7,483	$9,362	$7,657	$16,937	$9,280
Services	$26,094	$34,659	$54,168	$82,133	$27,965
Government	$21,392	$27,647	$29,699	$36,778	$7,079
Percent of Total*					% Change 1990-2000
Labor Earnings					33.2%
Non-Services Related	~25.0%	15.0%	22.1%	17.9%	9.0%
Farm	14.3%	1.7%	3.0%	na	-142.8%
Agricultural services, forestry, fishing & other	0.4%	0.7%	0.9%	1.9%	171.9%
Mining (including fossil fuels)	~0.1%	0.8%	4.8%	0.9%	-73.9%
Construction	4.3%	4.7%	6.7%	9.1%	84.0%
Manufacturing (incl. forest products)	5.8%	7.1%	6.7%	6.9%	39.6%
Services Related	62.6%	73.3%	61.7%	66.2%	44.4%
Transportation & public utilities	29.1%	42.9%	10.2%	8.3%	9.4%
Wholesale trade	1.2%	1.1%	2.5%	2.6%	40.6%
Retail trade	13.0%	10.8%	15.3%	15.2%	33.3%
Finance, insurance & real estate	4.3%	3.9%	4.2%	6.9%	121.2%
Services	15.1%	14.6%	29.5%	33.3%	51.6%
Government	12.4%	11.6%	16.2%	14.9%	23.8%

All earnings data are reported by *place of work*. Estimates for data that were not disclosed are indicated with tildes (~).
* Total is considered to be the sum of all reported or estimated income with positive values from the earnings by industry table.

The earnings data above are organized according to the Standard Industrial Classification (SIC) system. The data end in 2000 because in 2001 the U.S. Department of Commerce switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). More recent earnings trends, organized by NAICS, are shown in subsequent pages of this report.

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05.

Study Guide and Supplemental Information

How has earnings by industry changed historically?

What do we measure on this page?

This page describes historical change in earnings by industry (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The labor earnings data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Historical changes in labor earnings, by industry, show how the structure of the local economy has changed over time. Some of the trends are due to national and international factors, while other trends may reflect local conditions. The shifting sources of labor earnings can point to evolving weaknesses and strengths in the local or regional economy. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Most new jobs created in the U.S. economy in the last thirty years have been in services related sectors, a category that includes a wide variety of high and low-wage occupations ranging from jobs in hotels and amusement parks to legal, health, business, and educational services. The section in this report titled "*How do wages compare across industries?*" shows the difference in wages between various services related industries and compared to non-services related sectors.

In many small rural communities, government employment (e.g., the Forest Service and Bureau of Land Management) represents an important component of the economy. In others there have been important changes in employment in mining (which includes fossil fuel energy development), manufacturing (which includes lumber and wood products), and construction.

Methods

The labor earnings data are organized according to the Standard Industrial Classification (SIC) system. The data end in 2000 because in 2001 the Bureau of Economic Analysis switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). More recent personal income trends, organized by NAICS, are shown in subsequent pages of this report.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS industries are organized according to the production process.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)* and census.gov/eos/www/naics *(17)*.

For an overview of how historical changes in employment and personal income have affected rural America, see: Whitenar, L.A. and D.A. McGranahan. 2003. "Rural America: Opportunities and Challenges." Amber Waves. February, available at: ers.usda.gov/Amberwaves/Feb03/features/ruralamerica.htm *(13)*.

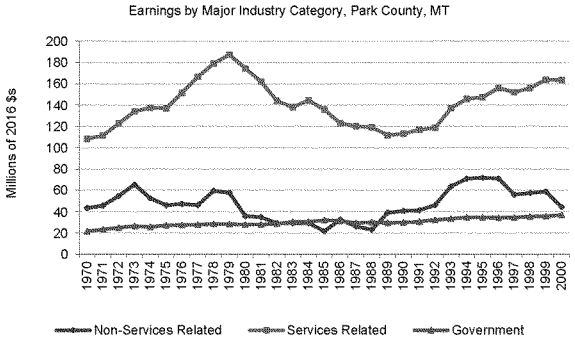
Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

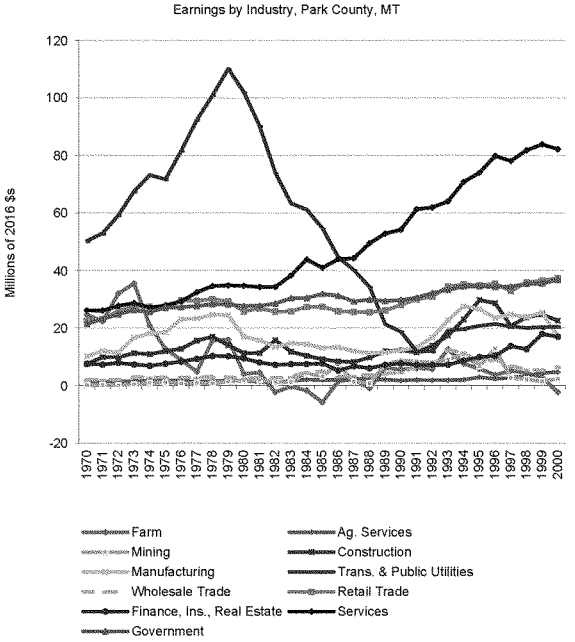
U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05.

Industry Sectors

- From 1970 to 2000, earnings from non-services related industries grew from $43.2 million to $44.2 million (in real terms), a 2% increase.
- From 1970 to 2000, earnings from services related industries grew from $108.3 million to $163.3 million (in real terms), a 51% increase.
- From 1970 to 2000, earnings from government grew from $21.4 million to $36.8 million (in real terms), a 72% increase.



- In 2000 the three industry sectors with the largest earnings were services ($82.1 million), retail trade ($37.4 million), and government ($36.8 million).
- From 1970 to 2000, the three industry sectors that added the most earnings were services ($56.0 million), government ($15.4 million), and retail trade ($14.9 million).



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05.

Study Guide and Supplemental Information

How has earnings by industry changed historically?

What do we measure on this page?

This page describes historical change in earnings by industry (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The labor earnings data are organized according to the Standard Industrial Classification (SIC) system and reported by place of work.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Historical changes in labor earnings, by industry, show how the structure of the local economy has changed over time. Some of the trends are due to national and international factors, while other trends may reflect local conditions. The shifting sources of labor earnings can point to evolving weaknesses and strengths in the local or regional economy. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Most new jobs created in the U.S. economy in the last thirty years have been in services related sectors, a category that includes a wide variety of high and low-wage occupations ranging from jobs in hotels and amusement parks to legal, health, business, and educational services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

In many small rural communities, government employment (e.g., the Forest Service and Bureau of Land Management) represents an important component of the economy. In others there have been important changes in employment in mining (which includes fossil fuel energy development), manufacturing (which includes lumber and wood products), and construction.

Methods

The labor earnings data are organized according to the Standard Industrial Classification (SIC) system. The data end in 2000 because in 2001 the Bureau of Economic Analysis switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). More recent personal income trends, organized by NAICS, are shown in subsequent pages of this report.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS industries are organized according to the production process.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)* and census.gov/eos/www/naics *(17)*.

For an overview of how historical changes in employment and personal income have affected rural America, see: Whitenar, L.A. and D.A. McGranahan. 2003. "Rural America: Opportunities and Challenges." Amber Waves. February, available at: ers.usda.gov/Amberwaves/Feb03/features/ruralamerica.htm *(13)*.

Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05.

Park County, MT

How has earnings by industry changed recently?

This page describes recent earnings change (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The earnings data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Earnings by Industry, 2001-2015 (Thousands of 2016 $s)

	2001	2005	2010	2015	Change 2010-2015
Labor Earnings	$269,620	$294,392	$284,978	$319,297	$34,319
Non-services related	$58,925	$72,910	~$57,795	$70,769	~$12,974
Farm	$861	$5,431	$2,309	$11,325	$9,016
Forestry, fishing, & ag. services	$5,745	$5,065	~$4,243	$4,959	~$716
Mining (including fossil fuels)	$142	$1,054	~$1,017	$622	-~$395
Construction	$31,669	$38,135	$32,155	$31,230	-$925
Manufacturing	$20,507	$23,226	$18,071	$22,633	$4,562
Services related	~$124,852	~$135,807	~$156,576	$202,554	~$45,978
Utilities	$3,515	$3,118	$4,010	$3,751	-$259
Wholesale trade	$3,551	$2,264	$4,740	$5,750	$1,010
Retail trade	$35,035	$24,178	$21,141	$21,241	$100
Transportation and warehousing	$18,406	$14,063	$9,317	$10,392	$1,075
Information	$4,921	$5,923	$4,494	$5,347	$853
Finance and insurance	$11,790	$8,325	$9,112	$9,644	$532
Real estate and rental and leasing	$2,854	$11,295	$10,295	$9,942	-$353
Professional and technical services	$14,443	$13,099	$14,055	$17,558	$3,503
Management of companies and enterprises	na	na	na	$4,012	na
Administrative and waste services	na	na	na	$7,976	na
Educational services	$2,016	$2,097	$4,294	$2,576	-$1,718
Health care and social assistance	$26,145	$32,364	$35,008	$36,054	$1,046
Arts, entertainment, and recreation	$8,825	$6,627	$4,882	$7,226	$2,344
Accommodation and food services	$23,160	$26,744	$32,330	$41,343	$9,013
Other services, except public administration	$14,637	$16,810	$18,711	$22,376	$3,665
Government	$37,255	$43,653	$43,414	$43,340	-$74

Percent of Total*					% Change 2010-2015
Labor Earnings					12.0%
Non-services related	22.2%	25.7%	~21.1%	22.2%	~22.4%
Farm	0.3%	1.9%	0.8%	3.5%	390.5%
Forestry, fishing, & ag. services	2.2%	1.8%	~1.6%	1.6%	~16.9%
Mining (including fossil fuels)	0.1%	0.4%	~0.4%	0.2%	-~38.8%
Construction	11.9%	13.5%	11.8%	9.8%	-2.9%
Manufacturing	7.7%	8.2%	6.6%	7.1%	25.2%
Services related	~47.0%	~47.9%	~57.2%	63.4%	~29.4%
Utilities	1.3%	1.1%	1.5%	1.2%	-6.5%
Wholesale trade	1.3%	0.8%	1.7%	1.8%	21.3%
Retail trade	13.2%	8.5%	7.7%	6.7%	0.5%
Transportation and warehousing	6.9%	5.0%	3.4%	3.3%	11.5%
Information	1.9%	2.1%	1.6%	1.7%	19.0%
Finance and insurance	4.4%	2.9%	3.3%	3.0%	5.8%
Real estate and rental and leasing	1.1%	4.0%	3.8%	3.1%	-3.4%
Professional and technical services	5.4%	4.6%	5.1%	5.5%	24.9%
Management of companies and enterprises	na	na	na	1.3%	na
Administrative and waste services	na	na	na	2.5%	na
Educational services	0.8%	0.7%	1.6%	0.8%	-40.0%
Health care and social assistance	9.8%	11.4%	12.8%	11.3%	3.0%
Arts, entertainment, and recreation	3.3%	2.3%	1.8%	2.3%	48.0%
Accommodation and food services	8.7%	9.4%	11.8%	12.9%	27.9%
Other services, except public administration	5.5%	5.9%	6.8%	7.0%	19.6%
Government	14.0%	15.4%	15.9%	13.6%	-0.2%

All earnings data are reported by *place of work*. Estimates for data that were not disclosed are indicated with tildes (~).

* Total is considered to be the sum of all reported or estimated income with positive values from the earnings by industry table.

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05N.

How has earnings by industry changed recently?

What do we measure on this page?

This page describes recent change in earnings (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The personal income data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Recent personal income trends organized by NAICS offer more detail than the old Standard Industrial Classification (SIC) system, particularly with regard to services related industries. This is especially useful since in many geographies the majority of new earnings growth in recent years has taken place in services related industries.

Although NAICS captures much more detail on personal income from services related sectors, these industries still encompass a wide variety of high and low-wage occupations ranging from jobs in accommodation and food services to professional and technical services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

It can be useful to ask whether the historical employment trends shown earlier in this report continue more recently, and what factors are driving a shift in industry makeup and competitive position. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Methods

In 2001, the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). An advantage of the NAICS method is the greater amount of detail to describe changes in the service related sectors.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)*.

For a review of the role of public lands amenities and transportation in economic development, see:

Rasker, R., P.H. Gude, J.A. Gude, J. van den Noort. 2009. "The Economic Importance of Air Travel in High-Amenity Rural Areas." Journal of Rural Studies 25: 343-353., available at: headwaterseconomics.com/3wests/Rasker_et_al_2009_Three_Wests.pdf *(15)*.

For a review of the role of amenities in rural development, see the U.S. Department of Agriculture's Economic Research Service: McGranahan, D. 1999. "Natural Amenities Drive Rural Population Change." Agricultural Economic Report No. (AER781), October. ers.usda.gov/publications/aer-agricultural-economic-report/aer781.aspx *(16)*.

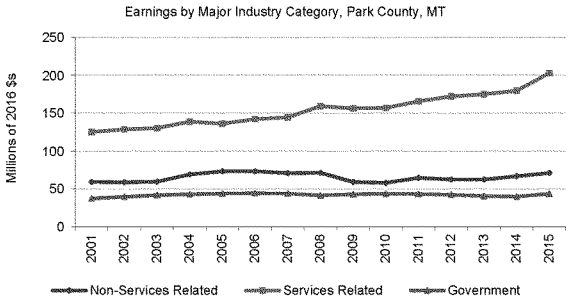
Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

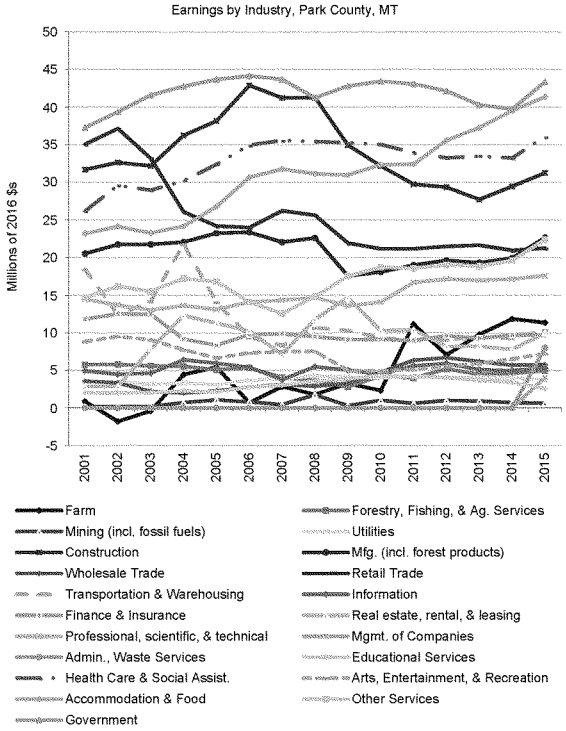
U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA25N.

Industry Sectors

- From 2001 to 2015, earnings in non-services related industries grew from $58.9 million to $70.8 million, a 20% increase.
- From 2001 to 2015, earnings in services related industries grew from $124.9 million to $202.6 million, a 62% increase.
- From 2001 to 2015, earnings in government grew from $37.3 million to $43.3 million, a 16% increase.



- In 2015 the three industry sectors with the largest earnings were government ($43.3 million), accommodation and food services ($41.3 million), and health care and social assistance ($36.1 million).
- From 2001 to 2015, the three industry sectors that added the most earnings were accommodation and food services ($18.2 million), health care and social assistance ($9.9 million), and other services, except public administration ($7.7 million).



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05N.

How has earnings by industry changed recently?

What do we measure on this page?

This page describes recent change in earnings (in real terms). Industries are organized according to three major categories: non-services related, services related, and government. The personal income data are organized according to the North American Industrial Classification System (NAICS) and reported by place of work.

Services Related: Consists of employment in industries such as retail trade, finance, insurance and real estate, and services.

Non-Services Related: Consists of employment in industries such as farm, mining, and manufacturing.

Government: Consists of federal, military, state and local government employment, and government enterprise.

Why is it important?

Recent personal income trends organized by NAICS offer more detail than the old Standard Industrial Classification (SIC) system, particularly with regard to services related industries. This is especially useful since in many geographies the majority of new earnings growth in recent years has taken place in services related industries.

Although NAICS captures much more detail on personal income from services related sectors, these industries still encompass a wide variety of high and low-wage occupations ranging from jobs in accommodation and food services to professional and technical services. The section in this report titled "How do wages compare across industries?" shows the difference in wages between various services related industries and compared to non-services related sectors.

It can be useful to ask whether the historical employment trends shown earlier in this report continue more recently, and what factors are driving a shift in industry makeup and competitive position. It may be the case that the economic role and contribution of public lands have changed along with broader economic shifts in many geographies.

Methods

In 2001, the Bureau of Economic Analysis (BEA) switched to organizing industry-level information according to the newer North American Industrial Classification System (NAICS). An advantage of the NAICS method is the greater amount of detail to describe changes in the service related sectors.

It is not normally appropriate to put SIC and NAICS data in the same tables and figures because of the difference in methods used to organize industry data. The SIC coding system organizes industries by the primary activity of the establishment. In NAICS, industries are organized according to the production process. See the Data Sources and Methods section of this report for more information on the shift from SIC to NAICS.

The terms non-services related and services related are not terms used by the U.S. Department of Commerce. They are used in these pages to help organize the information into easy-to-understand categories.

Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These values are indicated with tildes (~).

Additional Resources

For online SIC and NAICS manuals and definitions of industry codes, see: bls.gov/bls/NAICS.htm *(10)*.

For a review of the role of public lands amenities and transportation in economic development, see:

Rasker, R., P.H. Gude, J.A. Gude, J. van den Noort. 2009. "The Economic Importance of Air Travel in High-Amenity Rural Areas." Journal of Rural Studies 25: 343-353., available at: headwaterseconomics.com/3wests/Rasker_et_al_2009_Three_Wests.pdf *(15)*.

For a review of the role of amenities in rural development, see the U.S. Department of Agriculture's Economic Research Service: McGranahan, D. 1999. "Natural Amenities Drive Rural Population Change." Agricultural Economic Report No. (AER781), October. ers.usda.gov/publications/aer-agricultural-economic-report/aer781.aspx *(16)*.

Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps *(14)*.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA05N.

Park County, MT

Performance

How have earnings per job and per capita income changed?

This page describes how average earnings per job and per capita income (in real terms) have changed over time.

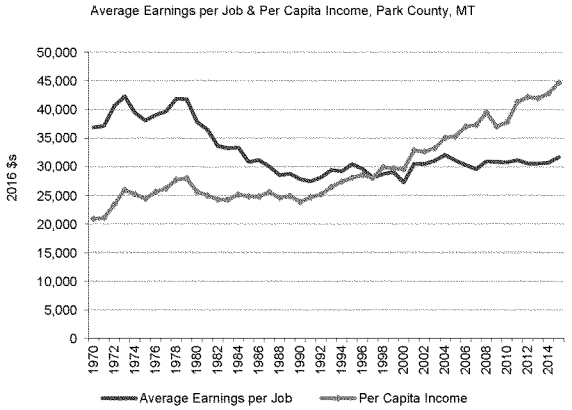
Average Earnings Per Job: This is a measure of the compensation of the average job. It is total earnings divided by total employment. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included.

Per Capita Income: This is a measure of income per person. It is total personal income (from labor and non-labor sources) divided by total population.

Average Earnings per Job & Per Capita Income, 1970-2015 (2016 $s)

	1970	1980	1990	2000	2015	Change 2000-2015
Average Earnings per Job	$36,822	$37,785	$27,785	$27,239	$31,623	$4,384
Per Capita Income	$20,866	$25,617	$23,823	$29,576	$44,680	$15,104
Percent Change						% Change 2000-2015
Average Earnings per Job						16.1%
Per Capita Income						51.1%

- From 1970 to 2015, average earnings per job shrank from $36,822 to $31,623 (in real terms), a 14% decrease.
- From 1970 to 2015, per capita income grew from $20,866 to $44,680 (in real terms), a 114% increase.



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Study Guide and Supplemental Information

How have earnings per job and per capita income changed?

What do we measure on this page?

This page describes how average earnings per job and per capita income (in real terms) have changed over time.

Average Earnings per Job: This is a measure of the compensation of the average job. It is total earnings divided by total employment. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included.

Per Capita Income: This is a measure of income per person. It is total personal income (from labor and non-labor sources) divided by total population.

Why is it important?

Average earnings per job is an indicator of the quality of local employment. A higher average earnings per job indicates that there are relatively more high-wage occupations. It can be useful to consider earnings against local cost of living indicators.

There are a number of reasons why average earnings per job may decline. These include: 1) more part-time and/or seasonal workers entering the workforce; 2) a rise in low-wage industries, such as tourism-related sectors; 3) a decline of high-wage industries, such as manufacturing; 4) more lower-paid workers entering the workforce; 5) the presence of a university with increasing an enrollment of relatively low-wage students; 6) an influx of workers with low education levels that are paid less; 7) the in-migration of semi-retired workers who work part-time and/or seasonally; and 8) an influx of people who move to an area for quality of life rather than profit-maximizing reasons.

Per capita income is considered one of the most important measures of economic well-being. However, this measure can be misleading. Per capita income is total personal income divided by population. Because total personal income includes non-labor income sources (dividends, interest, rent and transfer payments), it is possible for per capita income to be relatively high due to the presence of retirees and people with investment income. And because per capita income is calculated using total population and not the labor force as in average earnings per job, it is possible for per capita income to be relatively low when there are a disproportionate number of children and/or elderly people in the population.

Additional Resources

For an example of why average earnings per job may decline, one study has recently documented that workers would accept lower wages in order to live closer to environmental amenities. See: Schmidt, L. and P.N. Courant. 2006. "Sometimes Close is Good Enough: The Value of Nearby Environmental Amenities." Journal of Regional Science. 46(5): 931-951).

The Monthly Labor Review Online, published by the Bureau of Labor Statistics, contains several issues related to explaining earnings and wages, by industry, sex, and education achievement. See: bls.gov/opub/mlr/indexe.htm#Earnings_and_wages *(18)*.

To see the possible impact of non-labor income sources on per capita income, see previous sections of this report that show the percent contribution of non-labor to total personal income, or run the EPS Non-Labor Income report.

For a glossary of terms used by the Bureau of Economic Analysis, see: bea.gov/glossary/glossary.cfm *(8)*.

For a comprehensive cost of living index see: livingwage.geog.psu.edu/ *(19)*.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Table CA30.

Park County, MT

Performance

How do wages compare across industries?

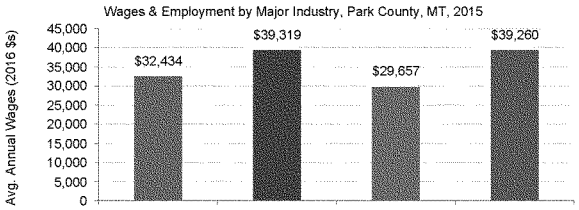
This page describes employment and average annual wages by industry. Industries are organized according to three major categories: non-services related, services related, and government.

Employment & Wages by Industry, 2015 (2016 $s)

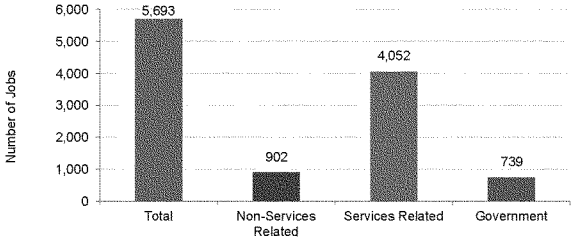
	Employment	% of Total Employment	Avg. Annual Wages	% Above or Below Avg.
Total	5,693		$32,434	
Private	4,954	87.0%	$31,416	-3.1%
Non-Services Related	902	15.8%	$39,319	21.2%
Natural Resources and Mining	171	3.0%	$34,784	7.2%
Agriculture, forestry, fishing & hunting	162	2.8%	$33,724	4.0%
Mining (incl. fossil fuels)	9	0.2%	$53,858	66.1%
Construction	308	5.4%	$37,236	14.8%
Manufacturing (Incl. forest products)	422	7.4%	$42,771	31.9%
Services Related	4,052	71.2%	$29,657	-8.6%
Trade, Transportation, and Utilities	823	14.5%	$29,202	-10.0%
Information	84	1.5%	$41,399	27.6%
Financial Activities	235	4.1%	$42,304	30.4%
Professional and Business Services	293	5.1%	$52,378	61.5%
Education and Health Services	720	12.6%	$38,288	18.0%
Leisure and Hospitality	1,494	26.2%	$19,024	-41.3%
Other Services	399	7.0%	$28,300	-12.7%
Unclassified	4	0.1%	$22,506	-30.6%
Government	739	13.0%	$39,260	21.0%
Federal Government	69	1.2%	$52,681	62.4%
State Government	56	1.0%	$63,890	97.0%
Local Government	614	10.8%	$35,505	9.5%

This table shows wage data from the Bureau of Labor Statistics, which does not report data for proprietors or the value of benefits and uses slightly different industry categories than those shown on previous pages of this report.

- In 2015 non-services related jobs paid the highest wages ($39,319) and services related jobs paid the lowest ($29,657).



- In 2015 trade, transportation, and utilities jobs employed the largest number of people (4,052), and federal government employed the smallest (739 jobs).



Data Sources: U.S. Department of Labor. 2016. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

Study Guide and Supplemental Information

How do wages compare across industries?

What do we measure on this page?

This page describes employment and average annual wages by industry. Industries are organized according to three major categories: non-services related, services related, and government.

The table compares level of employment and wages for all sectors of the economy, and shows (on the far right column) whether the sector's wages are above or below the average wage for all industries. The figures compare wages (top figure) by major category (non-services related, services related, and government) and the number of people employed in each category (bottom figure).

Average Annual Wages: This is total annual pay divided by total employment.

Why is it important?

It is often assumed that the only high-wage jobs in rural areas are in manufacturing and natural resource industries (e.g., timber, fossil fuel energy development, and mining). While these often provide the highest average wages, it is also possible for some components of services related industries to offer high wages (e.g., information, financial activities, and professional and business services). In addition, some places may have high average annual wages in a particular sector, but few people employed in that sector. Others may have low wages in a particular sector, and many people employed in that sector.

While nationally nearly all new jobs since 1990 have been in services related industries, they are not equally distributed across the country, and not all geographies are able to attract and retain the relatively high-wage services. Additional research would be needed to determine whether a geography has the elements that need to be in place to attract and keep high-wage services related workers. For example, those elements may include access to reliable transportation including airports, amenities, recreation opportunities, a trained workforce, and good schools. It is also worth investigating whether public lands play a role in attracting high-wage service workers.

In some geographies, the highest-paying jobs are in the public sector (e.g., in the Forest Service and Bureau of Land Management). During times of national recessions, a heavy reliance on government jobs may serve as an economic buffer against employment and earnings declines in the private sector.

Methods

Data are from the Bureau of Labor Statistics, which has the advantage of providing employment and wage data. However, the Bureau of Labor Statistics does not count the self-employed, so the employment numbers may differ from figures provided by other data sources used elsewhere in this report. As reported by the Bureau of Labor Statistics, wages include gross wages and salaries, bonuses, stock options, tips and other gratuities, and the value of meals and lodging.

Depending on the geographies selected, some data may not be available due to disclosure restrictions.

Average annual wages shown on this page is not the same as average earnings per job shown earlier in this report. Average annual wages are calculated from Bureau of Labor Statistics data, which do not include proprietors, and earnings per job are calculated from Bureau of Economic Analysis data, which include proprietors.

Additional Resources

For an overview of how the Bureau of Labor Statistics treats employment, see: bls.gov/bls/employment.htm *(20)*.

For an overview of how the Bureau of Labor Statistics treats pay and benefits, see: bls.gov/bls/wages.htm *(21)*.

Employment and wage estimates are also available from the Bureau of Labor Statistics for over 800 occupations. Looking at services by occupation, rather than by sector or industry, is helpful since wages vary dramatically across occupations associated with different services. For more information, see: bls.gov/oes *(22)*.

For a peer-reviewed journal article and interactive web tool on the importance of transportation to attracting high-wage "knowledge-based" workers to areas with high amenities, see: Rasker, R., P.H. Gude, J.A. Gude, J. van den Noort. 2009. "The Economic Importance of Air Travel in High-Amenity Rural Areas." Journal of Rural Studies 25(2009): 343-353, available at: headwaterseconomics.org/3wests.php *(3)*.

See also Knapp, T.A., and P.E. Graves. 1989. On the Role of Amenities in Models of Migration and Regional Development. Journal of Regional Science 29(1): 71-87. This article specifically captures the idea that amenity values are capitalized into wages.

Data Sources

U.S. Department of Labor. 2016. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

Park County, MT

Performance

How has the unemployment rate changed?

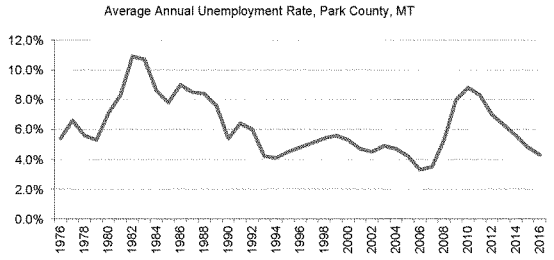
This page describes the average annual unemployment rate and the seasonality of the unemployment rate over time.

Unemployment Rate: The number of people who are jobless, looking for jobs, and available for work divided by the labor force.

Average Annual Unemployment Rate, 1976-2016

	1976	1990	2000	2010	2016	Change 2010-2016
Unemployment Rate	5.4%	5.4%	5.3%	8.8%	4.3%	-4.5%

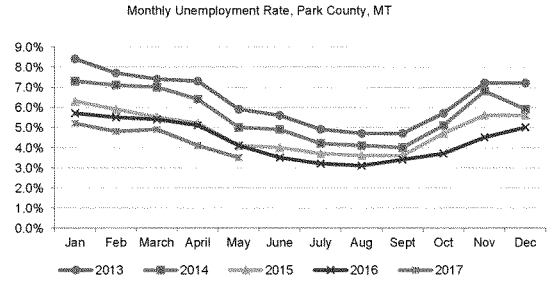
- Since 1976, the annual unemployment rate ranged from a low of 3.3% in 2006 to a high of 10.9% in 1982.



Monthly Unemployment Rate, 2013-2017

Unemployment Rate (%)	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2013	8.4%	7.7%	7.4%	7.3%	5.9%	5.6%	4.9%	4.7%	4.7%	5.7%	7.2%	7.2%
2014	7.3%	7.1%	7.0%	6.4%	5.0%	4.9%	4.2%	4.1%	4.0%	5.1%	6.8%	5.9%
2015	6.3%	5.9%	5.5%	5.2%	4.1%	4.0%	3.7%	3.6%	3.6%	4.7%	5.6%	5.6%
2016	5.7%	5.5%	5.4%	5.1%	4.1%	3.5%	3.2%	3.1%	3.4%	3.7%	4.5%	5.0%
2017	5.2%	4.8%	4.9%	4.1%	3.5%							

- The lowest monthly unemployment rate was Aug of 2016. The highest monthly unemployment rate was Jan of 2013.



Data Sources: U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.

Study Guide and Supplemental Information

How has the unemployment rate changed?

What do we measure on this page?

This page describes the average annual unemployment rate and the seasonality of the unemployment rate over time.

The figure Average Annual Unemployment Rate shows the rate of unemployment since 1990. The figure Seasonal Unemployment Rate shows the rate of unemployment for the last five years, for each month of the year. This figure is useful to see if there are higher rates of unemployment during certain months of the year, and whether this has changed over time.

Unemployment Rate: The number of people who are jobless, looking for jobs, and available for work divided by the labor force.

Why is it important?

The rate of unemployment is an important indicator of economic well-being. This figure can go up during national recessions and/or when more localized economies are affected by area downturns. There can also be significant seasonal variations in unemployment.

It is important to know how the unemployment rate has changed over time, whether there are periods of the year where the rate is higher or lower, and if this seasonality of unemployment has changed over time. Geographies that are heavily dependent on the tourism industry, for example, may show higher rates of unemployment during Spring and Fall "shoulder seasons." Places that rely heavily on the construction industry, for example, may have lower unemployment rates during the non-winter months.

As the economy of a place diversifies, it can become more resilient and less affected by downturns and rising unemployment rates. This is particularly true of places that are able to attract in-migration, retain manufacturing, and support a high-tech economy.

Public land agencies sometimes provide seasonal employment and may have an effect on the local rate of unemployment.

Methods

Data begin in 1990 because prior to that the Bureau of Labor Statistics used a different method to calculate the unemployment rate.

Additional Resources

For more information on unemployment, see related Bureau of Labor Statistics resources, available at: bls.gov/cps/faq.htm#Ques3 *(23)*.

For more information on business cycles, see related National Bureau of Business Research, available at: nber.org *(24)*.

For research findings on economic resiliency, see: Chapple, K., and T. W. Lester. 2010. "The resilient regional labor market? The U.S. case." Cambridge Journal of Regions, Economy and Society 3:85-104.

Data Sources

U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.

Park County, MT

Performance

What are the commuting patterns in the region?

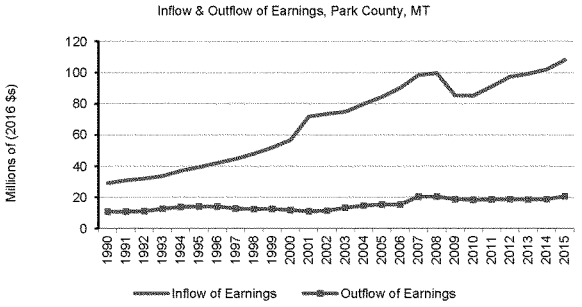
This page describes the flow of earnings into the county by residents who work in neighboring counties (an "inflow" of earnings because they bring money home); the flow of earnings by residents from neighboring counties who commute into the county for work (an "outflow" of earnings because they take their earnings with them); and the difference between the two ("net residential adjustment").

Cross-County Earnings, 1990-2015 (Thousands of 2016 $s)

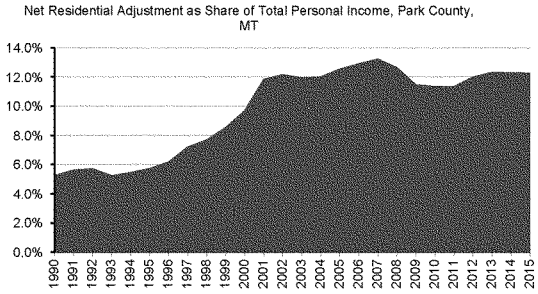
	1990	2000	2010	2015	Change 2010-2015
Total Personal Income	348,837	464,636	588,759	713,624	124,865
Cross-County Commuting Flows					
Inflow of Earnings	28,913	56,642	85,094	107,954	22,860
Outflow of Earnings	10,669	11,736	18,338	20,558	2,220
Net Residential Adjustment (Inflow - Outflow)	18,243	44,906	66,756	87,397	20,641
Percent of Total					% Change 2010-2015
Net Residential Adjustment Share of Total Personal Income	5.2%	9.7%	11.3%	12.2%	0.9%

Data are only available at the county level (i.e., this page will be blank for aggregated geographies, states, and the U.S.). Total personal income is reported by *place of residence*.

- From 1990 to 2015 inflow of earnings grew from $28.9 million to $108.0 million (in real terms), a 273% increase.
- From 1990 to 2015 outflow of earnings grew from $10.7 million to $20.6 million (in real terms), a 93% increase.



- From 1990 to 2015, net residential adjustment (inflow - outflow) changed from 5.2 to 12.2 percent of total personal income.



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA30 & CA91.

Study Guide and Supplemental Information

What are the commuting patterns in the region?

What do we measure on this page?

This page describes the flow of earnings into the county by residents who work in neighboring counties ("inflow" of earnings because they bring money home); the flow of earnings by residents from neighboring counties who commute into the county for work ("outflow" of earnings because they take their earnings with them); and the difference between the two ("net residential adjustment").

If net residential adjustment is positive (inflow exceed outflow), it means county residents commute outside the county for work and bring in more personal income than leaves the county in net terms. If net residential adjustment is negative (outflow exceeds inflow), it means the economy of the county attracts workers from nearby counties and loses more personal income than it brings into the county in net terms.

Inflow of Earnings: These are the gross annual earnings of in-commuters; i.e., from people who work out of the county, and bring money home.
Outflow of Earnings: These are the gross annual earnings of out-commuters; i.e., from people who work in the county, but live elsewhere and take their earnings with them.
Net Residence Adjustment: This is the net inflow of labor earnings of inter-area commuters.
Note: Data only available at the county level (i.e., this page will be blank for profiles of aggregated geographies, states, and the U.S.).

Why is it important?

One indicator of economic health for a county is whether it is able to attract workers from nearby counties. This could be the case if a county has a surplus of jobs and serves as a magnet for workers in adjacent counties and would be indicated by a negative net residential adjustment. Another possibility is that housing in the county has driven some workers to live in relatively more affordable neighboring counties that have become "bedroom communities."

Alternatively, it is possible that a county with a positive net residential adjustment is a more desirable place to live (people are willing to commute and/or telecommute to work in order to live there for quality of life reasons). Commuting and telecommuting workers may also contribute to the economy by spending their money in the local area (essentially exporting work and importing wages).

Long-term trends in inflow, outflow, and net residential adjustment help to describe the role that the county's economy has played over time in a multi-county area. For example, a net residential adjustment that was positive but is today negative indicates that county residents used to have to commute to neighboring counties for work but today the reverse is true and the county attracts workers from neighboring counties.
If net residential adjustment is a large share of earnings (e.g., 10% of higher) it may indicate that the appropriate unit of analysis is a multi-county area that encompasses the entire labor market.

Methods

Data begin in 1990 because that is the year the Bureau of Economic Analysis began reporting this data set.
According to the Bureau of Economic Analysis, "Estimates of gross commuters' earnings inflow and outflow are derived from the residence adjustment estimates, which are the estimates of the net inflow of the earnings of inter-area commuters. In the personal income accounts, the residence adjustment estimates are added to place-of-work earnings estimates to yield place-of-residence earnings estimates. This conversion process is an important part of the local area economic accounts because personal income is a place-of-residence measure, whereas the data used to estimate over 60 percent of personal income is reported on a place-of-work basis."

For a description of the methods used by the Bureau of Economic Analysis to estimate the flow of earnings across counties, see: bea.gov/regional/reis *(25)*. Select Table CA91 for any geography. When data are displayed, select the question mark icon for definitions and a brief description of methods.

Additional Resources

For a glossary of terms used by the Bureau of Economic Analysis with definitions, see: bea.gov/regional/definitions *(9)*.

The Bureau of Economic Analysis also reports the number of workers commuting between counties. These data are limited to Decennial Census years (1970, 1980, 1990 and 2000); see: bea.gov/regional/reis/jtw *(26)*.

For an example of a study where a negative residential adjustment is considered a positive indicator, see Mack, E., T.H. Grubesic and E. Kessler. 2007. "Indices of Industrial Diversity and Regional Economic Composition." Growth and Change 38(3): 474-509.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA30 & CA91.

Park County, MT

Performance

Do national recessions affect local employment?

This page describes long-term trends in employment during national recession and recovery periods.

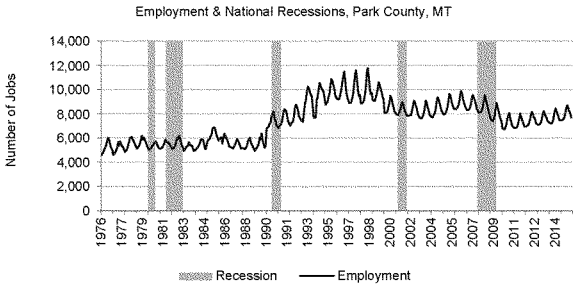
Employment Change During National Recessions, 1976-2015

	Jan '80 - July '80	July '81 - Nov '82	July '90 - Mar '91	Mar '01 - Nov '01	Dec '07 - June '09
Employment Change (Net Jobs)	549	-340	-799	63	64
Employment Change (Monthly % Change)	1.6%	-0.4%	-1.1%	0.1%	0.0%

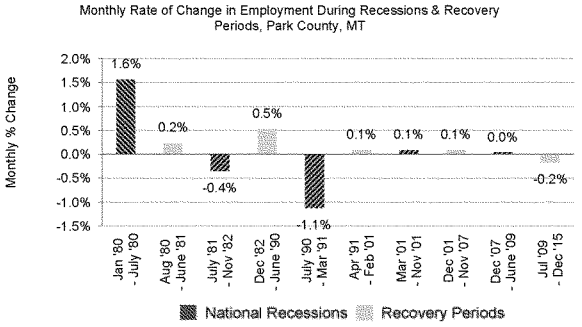
Employment Change During Recovery from National Recessions, 1976-2015

	Aug '80 - June '81	Dec '82 - June '90	Apr '91 - Feb '01	Dec '01 - Nov '07	Jul '09 - Dec '15
Employment Change (Net Jobs)	143	2,534	765	519	-1,272
Employment Change (Monthly % Change)	0.2%	0.5%	0.1%	0.1%	-0.2%

- From December of 1976 to December of 2015, employment grew from 5,036 to 7,598 jobs, a 51% increase.



- In the recovery period (Dec '82-Jun '90) following the 1981-1982 recession, employment grew by 2,534 jobs, a 0.5% monthly increase.



Blue vertical bars in the figures above represent the last five recession periods: January 1980 to July 1980; July 1981 to November 1982; July 1990 to March 1991; March 2001 to November 2001; and December 2007 to June 2009. The green columns in the figure above represent the intervening recovery periods.

Data Sources: U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; National Bureau of Economic Research. 2009. U.S. Business Cycle Expansions and Contractions, Cambridge, MA

Do national recessions affect local employment?

What do we measure on this page?

This page describes long-term trends in employment during national recession and recovery periods.

The figure Employment and National Recessions shows long-term change in employment against periods of national recession (blue bars) and recovery. The figure Employment During Recessions and Recovery Periods shows the percent gain or loss in employment during periods of national recession (blue bars) and recovery (green bars).

Recession: According to the National Bureau of Economic Research: "A recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. A recession begins just after the economy reaches a peak of activity and ends as the economy reaches its trough. Between trough and peak, the economy is in an expansion."

Why is it important?

One measure of economic well-being is the resilience of the local economy during periods of national recession. It is a positive sign if local employment continues to grow (or does not decline) during a recession.

Another sign of economic well-being is how well the local economy recovers from a recession, measured as growth of employment from the trough (at the depth of the recession) to the peak (just before the next period of decline).

As the economy of a place diversifies, it can become more resilient and less affected by economic downturns. This is particularly true of places that are able to attract in-migration, retain manufacturing, and support a high-tech economy.

Government employment, including in public land agencies, can help to absorb some of the losses in private sector economic activity during a recession.

Methods

The U.S. Bureau of Labor Statistics changed methodology related to unemployment rates in 1990. Caution should be used comparing pre-1990 estimates of unemployment rates with those from 1990 forward.

Additional Resources

For information regarding data collection and methodology for labor force statistics compiled by the Bureau of Labor Statistics, see bls.gov/lau/laumthd.htm *(27)*. Please note that Local Area Unemployment Statistics data prior to 1990 are no longer support by the Bureau of Labor Statistics.

For a definition of a recession and recovery periods, see the National Bureau of Economic Research: nber.org/cycles/recessions.html *(28)*; and National Bureau of Economic Research, Inc. 2009. U.S. Business Cycle Expansions and Contractions, available at: nber.org/cycles/cyclesmain.html *(29)*.

For a list of national recessions and recovery periods, see: nber.org/cycles/cyclesmain.html *(29)*.

For research findings on economic resiliency, see: Chapple, K., and T. W. Lester. 2010. "The resilient regional labor market? The U.S. case." Cambridge Journal of Regions, Economy and Society 3:85-104.

Data Sources

U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; National Bureau of Economic Research. 2009. U.S. Business Cycle Expansions and Contractions, Cambridge, MA

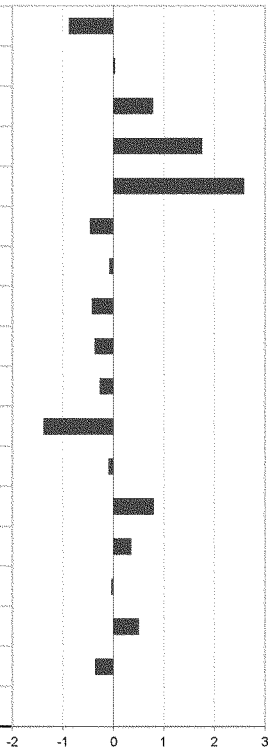
Park County, MT

Benchmarks

How does performance compare to the benchmark?

This page describes key performance indicators for the selected geography and compares them to the selected benchmark area. (If no custom benchmark area was selected, EPS defaults to benchmarking against the U.S.) Performance indicators are organized by groups (trends, prosperity, stress, and structure) that highlight potential competitive strengths and weaknesses.

Relative Performance, 2015		Park County, MT	Benchmark: U.S.
Trends	Population (percent change, 2000-2015)	1.7%	13.9%
	Employment (percent change, 2000-2015)	15.0%	15.0%
	Personal Income (percent change, 2000-2015)	53.6%	30.1%
	Average Earnings per Job (percent change, 2000-2015)	16.1%	5.8%
	Per Capita Income (percent change, 2000-2015)	51.1%	14.2%
Prosperity	Average Earnings per Job	$31,623	$58,985
	Per Capita Income	$44,680	$48,737
	Average Annual Wages - Services Related	$29,657	$51,711
	Average Annual Wages - Non-Services Related	$39,319	$62,281
	Average Annual Wages - Government Related	$39,260	$53,982
Stress	Unemployment Rate (change 2000-2015)	-0.5%	1.3%
	Unemployment Rate	4.8%	5.3%
Structure	Percent of Employment in Proprietors	40.2%	22.4%
	Percent of Personal Income in Non-Labor	48.9%	36.1%
	Percent of Services Related Jobs	69.6%	72.5%
	Percent of Non-Services Related Jobs	22.2%	14.8%
	Percent of Government Jobs	8.1%	12.7%
	Commuting (net residential adjustment share of personal income)	12.2%	0.0%



Commuting statistics are displayed only when comparing a county to a benchmark county.

- Park County, MT is most different from the U.S. in per capita income (percent change, 2000-2015), average earnings per job (percent change, 2000-2015), and unemployment rate (change 2000-2015).

Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; U.S. Department of Labor. 2016. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

Study Guide and Supplemental Information

How does performance compare to the benchmark?

What do we measure on this page?

This page describes key performance indicators for the selected geography and compares them to the selected benchmark area. (If no custom benchmark area was selected, EPS defaults to benchmarking against the U.S.) Performance indicators are organized by groups (trends, prosperity, stress, and structure) that highlight potential competitive strengths and weaknesses.

Some indicators require a judgment call to decide whether they represent a positive or negative indicator of well-being. For example, having a high percentage of personal income in a place in the form of non-labor income could mean that place has done a good job of attracting retirees and investment income. However, it could also mean there is very little labor income, so non-labor income is relatively larger.

The term "benchmark" in this report should not be construed as having the same meaning as in the National Forest Management Act (NFMA).

Why is it important?

A number of indicators determine the economic health of a place. No single indicator should be used by itself. Rather, a range of indicators should be analyzed together to get a comprehensive view of the economy.

When considering the benefits of growth, it is important to distinguish between standard of living (such as earnings per job and per capita income) and quality of life (such as leisure time, crime rate, and sense of well-being).

In some cases it may be appropriate to compare a local economy to the U.S. economy. In most cases, however, it will be more useful to compare county or regional economies with other similar county or regional economies. For example, if the county being analyzed is small and rural, it should be compared to similar counties because comparing against the U.S. will include data from large metropolitan areas.

Additional Resources

Additional information for a range of geographies and measures can be obtained by running other EPS reports.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.; U.S. Department of Labor. 2016. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Washington, D.C.

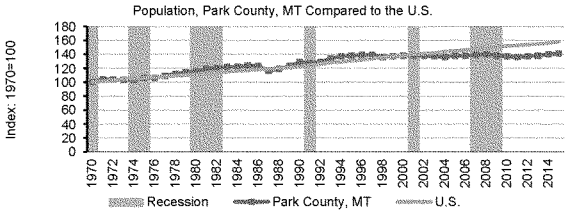
Park County, MT

Benchmarks

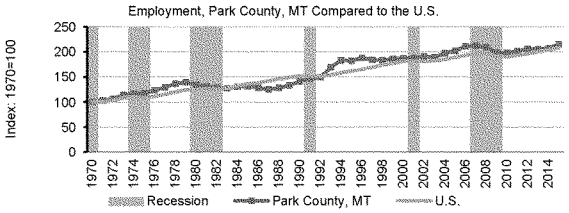
How does performance compare to the benchmark?

This page describes trends in key performance indicators (change in population, employment, real personal income, and the unemployment rate) for the selected geography and compares them to the selected benchmark area. Blue vertical bars indicate years when a national recession occurred.

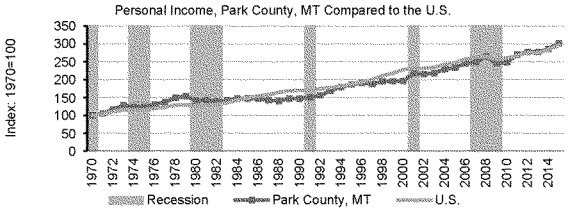
- From 1970 to 2015, population in Park County, MT grew by 41% compared to 58% for the U.S..



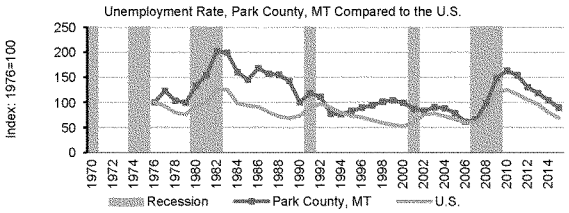
- From 1970 to 2015, employment in Park County, MT grew by 115% compared to 108% for the U.S..



- From 1970 to 2015, personal income in Park County, MT grew by 201% compared to 196% for the U.S..



- From 1976 to 2015, the unemployment rate in Park County, MT shrank by 11% compared to -31% for the U.S..



Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.

Study Guide and Supplemental Information

How does performance compare to the benchmark?

What do we measure on this page?

This page describes trends in key performance indicators (change in population, employment, real personal income, and the unemployment rate) for the selected geography and compares them to the selected benchmark area. Blue vertical bars indicate periods of national recession.

Population, employment, and real personal income indicators are indexed to 1970 so that data from geographies of different sizes can be compared on the same figure. The unemployment rate is shown as a percent. The figures are most useful for showing the relative difference in the rate of change for each indicator.

The term "benchmark" in this report should not be construed as having the same meaning as in the National Forest Management Act (NFMA).

Why is it important?

This page offers an at-a-glance view of long-term economic performance. It allows the user to see if the selected geography performs differently than a selected benchmark area and how it is subject to national business cycles.

Additional Resources

Additional information for a range of geographies and measures can be obtained by running other EPS reports.

Data Sources

U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.; U.S. Department of Labor. 2017. Bureau of Labor Statistics, Local Area Unemployment Statistics, Washington, D.C.

Data Sources & Methods

Data Sources

The EPS Measures report uses published statistics from government sources that are available to the public and cover the entire country. All data used in EPS can be readily verified by going to the original source. The contact information for databases used in this profile is:

- **Regional Economic Information System**
  Bureau of Economic Analysis, U.S. Department of Commerce
  http://bea.gov/bea/regional/data.htm
  Tel. 202-606-9600
- **Local Area Unemployment Statistics**
  Bureau of Labor Statistics, U.S. Department of Labor
  http://www.bls.gov/lau
  Tel. 202-691-6392
- **Quarterly Census of Employment and Wages**
  Bureau of Labor Statistics, U.S. Department of Labor
  http://www.bls.gov/cew
  Tel. 202-691-6567
- **Population Division**
  Census Bureau, U.S. Department of Commerce.
  http://www.census.gov/population/www/
  Tel. 866-758-1060
- **National Bureau of Economic Research**
  http://www.nber.org/cycles/recessions.html
  Tel. 617-868-3900

Methods

EPS core approaches: EPS is designed to focus on long-term trends across a range of important measures. Trend analysis provides a more comprehensive view of changes than spot data for select years. We encourage users to focus on major trends rather than absolute numbers. EPS displays detailed industry-level data to show changes in the composition of the economy over time and the mix of industries at points in time. EPS employs cross-sectional benchmarking, comparing smaller geographies such as counties to larger regions, states, and the nation, to give a sense of relative performance. EPS allows users to aggregate data for multiple geographies, such as multi-county regions, to accommodate a flexible range of user-defined areas of interest and to allow for more sophisticated cross-sectional comparisons.

SIC to NAICS: Starting in the 1930s, the Standard Industrial Classification (SIC) system has served as the structure for the collection, aggregation, presentation, and analysis of the U.S. economy. Under SIC, which employed a four-digit coding structure, an industry consists of a group of establishments primarily engaged in producing or handling the same product or group of products or in rendering the same services. As the U.S. economy shifted from a primary emphasis on manufacturing to a more complex services economy, SIC became less useful as a tool for describing the economy's changing industrial composition.

The North American Industry Classification System (NAICS), developed using a production-oriented conceptual framework, groups establishments into industries based on the activity in which they are primarily engaged. NAICS uses a six-digit hierarchical coding system to classify all economic activity into twenty industry sectors. Five sectors are mainly goods-producing sectors and fifteen are entirely services-producing sectors.

Adjusting dollar figures for inflation: Because a dollar in the past was worth more than a dollar today, data reported in current dollar terms should be adjusted for inflation. The U.S. Department of Commerce reports personal income figures in terms of current dollars. All income data in EPS are adjusted to real (or constant) dollars using the Consumer Price Index. Figures are adjusted to the latest date for which the annual Consumer Price Index is available.

Data gaps and estimation: Some data are withheld by the federal government to avoid the disclosure of potentially confidential information. Headwaters Economics uses supplemental data from the U.S. Department of Commerce to estimate these data gaps. These are indicated in italics in tables. Documentation explaining methods developed by Headwaters Economics for estimating disclosure gaps is available at headwaterseconomics.org/eps.

Links to Additional Resources

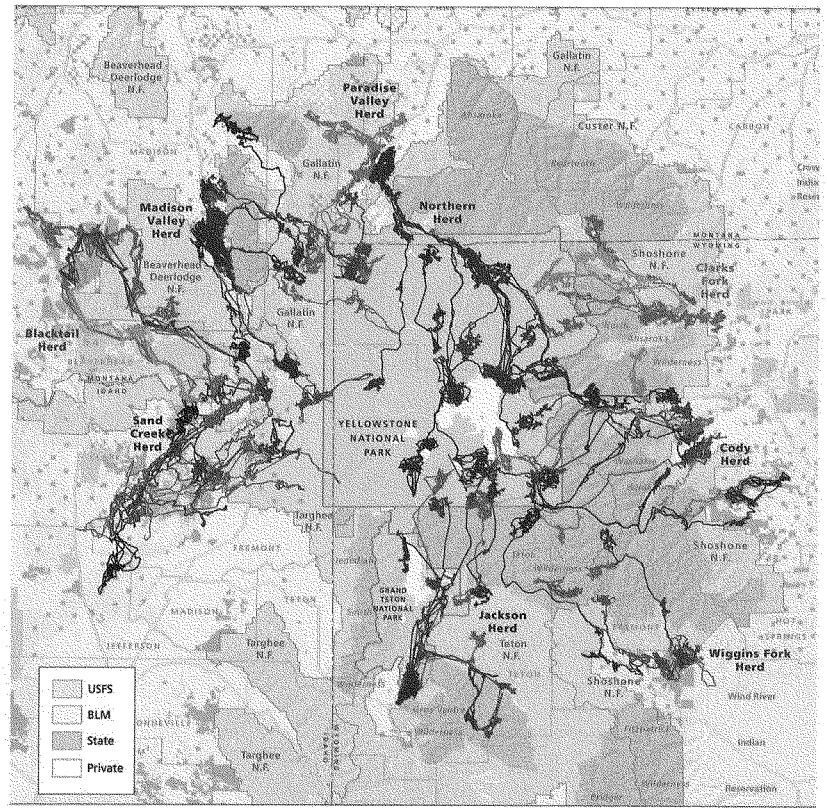
For more information about EPS see:

headwaterseconomics.org/eps

Web pages listed under Additional Resources include:

Throughout this report, references to on-line resources are indicated with italicized numbers in parentheses. These resources are provided as hyperlinks here.

1 www.bea.gov/SCB/PDF/2004/11November/1104Econ-Areas.pdf
2 www.ers.usda.gov/Briefing/Rurality/Typology
3 headwaterseconomics.org/3wests.php
4 www.bea.gov/regional/docs/econlist.cfm
5 www.census.gov/popest/about/terms.html
6 www.census.gov/popest/methodology/index.html
7 www.bea.gov/regional/definitions/nextpage.cfm?key=Proprietors%20employment
8 www.bea.gov/glossary/glossary.cfm
9 www.bea.gov/regional/definitions
10 www.bls.gov/bls/NAICS.htm
11 www.bls.gov/opub/mlr/2009/11
12 www.bls.gov/opub/mlr/2012/01/art1full.pdf
13 www.ers.usda.gov/Amberwaves/Feb03/features/ruralamerica.htm
14 headwaterseconomics.org/eps
15 www.headwaterseconomics.com/3wests/Rasker_et_al_2009_Three_Wests.pdf
16 www.ers.usda.gov/publications/aer-agricultural-economic-report/aer781.aspx
17 www.census.gov/eos/www/naics
18 www.bls.gov/opub/mlr/indexe.htm#Earnings_and_wages
19 www.livingwage.geog.psu.edu/
20 www.bls.gov/bls/employment.htm
21 www.bls.gov/bls/wages.htm
22 www.bls.gov/oes
23 www.bls.gov/cps/faq.htm#Ques3
24 www.nber.org
25 www.bea.gov/regional/reis
26 www.bea.gov/regional/reis/jtw
27 www.bls.gov/lau/laumthd.htm
28 www.nber.org/cycles/recessions.html
29 www.nber.org/cycles/cyclesmain.html



Elk Migrations of the Greater Yellowstone Ecosystem

- Blacktail Herd
- Clarks Fork Herd
- Cody Herd
- Jackson Herd
- Madison Valley Herd
- Northern Herd
- Paradise Valley Herd
- Sand Creek Herd
- Wiggins Fork Herd

N 0 5 10 20 30 40 50 mi.
0 5 10 20 30 40 50 km

September 18, 2015 DRAFT

WYOMING MIGRATION INITIATIVE

© 2015 University of Wyoming

Source: Atlas of Wildlife Migration: Wyoming's Ungulates (in production)
Cartography: University of Oregon InfoGraphics Lab
Elk data contributed by: Wyoming Game and Fish Department, Montana Fish, Wildlife, and Parks; Idaho Fish and Game, National Park Service, US Fish and Wildlife Service, Wildlife Conservation Society, Wyoming Cooperative Fish and Wildlife Research Unit, Iowa State University; and Yale School of Forestry and Environmental Studies

STANLEY B. MCCAMMON
PRESIDENT AND CEO
206.624.9604

July 21, 2017

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

RE: 7-26-2017 – Yellowstone Gateway Protection Act (S.941) Hearing

Dear Chairman Murkowski and Ranking Member Cantwell:

I am writing the Committee in support of the Yellowstone Gateway Protection Act (S.941), which would permanently protect over 30,000 acres of public land at the northern boundary of Yellowstone National Park and in Emigrant Gulch from industrial gold mining while preserving clean water, public access, wildlife migrations, outdoor recreation and the unspoiled natural amenities our community and our businesses rely upon.

Back in 2015, the Joshua Green Corporation purchased 1,200 acres at the mouth of Emigrant Gulch in Paradise Valley, Park County, Montana. We purchased this land for several reasons, but primarily because we wanted to build a lodge that celebrates the majesty of the Park, the Yellowstone River and the Paradise Valley. We intend to own it for a long time, much like our office building in Seattle (over 100 years), and so we have a significant long term interest in the outcome of this matter. This is an investment in critical wildlife habitat, riparian flood plains and cold, clear tributaries overlooking the renowned Yellowstone River under the protective watch of Emigrant Peak. There is literally no other place on the planet like it.

We are currently building a lodge and accompanying cabins midway between Livingston, MT and Gardiner. "Sage Lodge" will provide a plethora of activities in support of the existing outdoors and recreational businesses operating in the valley, and it will become one of the largest employers in Park County. We are working with Columbia Hospitality, a premier hospitality company, to provide an international destination that will be best in class, while being open to the public to enjoy our restaurants, bars and lodging space as well as to participate in community events and gatherings.

We are the largest water right holder on Emigrant Creek. The water we rely on for healthy trout habitat and to maintain our existing irrigation and agricultural operations on our property literally originates from the ground that a gold mine will dig up. Emigrant Gulch holds copper-gold porphyry ore bodies which means once ore and waste rock minerals are exposed to air and water, acid drainage will overwhelm the delicate balance of Emigrant Creek.

The gravel roads leading from Emigrant Gulch run adjacent to or through our property. Hundreds of trucks a day would be required to mine here and would directly impact the success of our business and

P.O. Box 21829 • Seattle, Washington • 98111-3829 • 1425 – 4th Ave #420 [98101] • 206.622.0420 • www.joshuagreencorp.com

way of life for our employees, guests and the wildlife native to the area. As you can imagine, protecting Emigrant Gulch and the surrounding lands and water is paramount to the sustainability and stewardship of the Sage Lodge property, surrounding lands, neighbors and inhabitants.

Joshua Green Corporation and all of our subsidiaries, employees, suppliers, and investors view industrial gold mining in Yellowstone's Gateway as a significant threat to the values promoting sustainable businesses for the long-term. Mining operations come and go for short-term profit of a few. Sage Lodge looks forward to generations of employment and promoting the clean water, land and wildlife that drives the healthy economy and way of life of Park County, and Montana.

Sincerely,

Stanley B. McCammon

SBM:sls
cc: The Honorable Senator Jon Tester
The Honorable Senator Steve Daines
Ms. Andrea Brudnicki

Recent Photos of Sage Lodge area:

Figure 1: Sage Lodge and cabins

Figure 2: View of Emigrant Peak from Grand Room

Figure 3: Emigrant Peak and the Yellowstone River

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Committee on Energy and Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

Dear Chairman Murkowski and Ranking Member Cantwell:

I am writing the Committee to support for the Yellowstone Gateway Protection Act (S.941). I am urging the committee to consider this bill, efficiently address any concerns and quickly move it out of committee into mark up.

I am a resident of Gardiner Montana, the northern gateway to Yellowstone National Park. I am also gold exploration geologist with 27 years of direct experience managing multi-million dollar, drill-intensive exploration programs in northern Nevada. I am a professional member of the American Exploration and Mining Association. In keeping with an open format and full disclosure, the following bullets summarize my professional credentials and direct experiences as they relate to gold exploration.

- Employment history: Newmont (11 years), Placer Dome (4.5 years), Miranda Gold (5 years), Evolving Gold (1.5 years), and my current employer Gold Standard Ventures (5 years).
- As a senior team leader / team member, involved in 10 gold discoveries, six of which have been developed into profitable mines.
- Earned a BSc. in Geology from the University of Wisconsin-River Falls (1990).
- AIPG Certified Professional Geologist (CPG-10216) since 1997.
- A Qualified Person as defined by NI 43-101, Standards of Disclosure for Mineral Projects.
- Numerous peer-reviewed publications describing geology and exploration associated with a number of the discoveries mentioned above.

I can state without reservation that the border of Yellowstone National Park and Paradise Valley is absolutely no place for a gold mine. Neither the Emigrant nor Crevice mining districts have a proven mineral "resource or reserve" based on current NI43-101 standards. Mineral resources which are not mineral reserves do not have demonstrated economic viability.

My wife works for Yellowstone National Park and as residents of Gardiner we experience first-hand how the current healthy economy is straining local housing, trash and sewer collection, employees and emergency services. The county struggles to supply an adequate amount of these services in the current market. The local roads passing directly through our gateway communities, mere feet from family-owned businesses and residences, are no place for mining traffic. The potential cash-flow from a handful on new mining jobs is dwarfed by the long-lived economic benefits derived from the +4 million visitors from across the globe that enjoy Yellowstone National Park and the surrounding national forest lands and rivers.

We should ask ourselves why major gold mining operations with adequate financing, experience and knowledge to properly explore with proper base line testing, water monitoring, reclamation plans, bonding and other necessary investments have shown no interest in exploring these deposits even when gold was as high as $1,700 an ounce. The answer is simple. Legitimate mining/exploration companies

don't see an upside to exploration potential next to Yellowstone and they recognize the massive socio-economic hurdles associated with local gateway communities and the worlds' first national park. Is it no surprise that hundreds of businesses and elected officials from the local to state to federal levels have all agreed this is no place for a gold mine.

World-wide, hard rock mining today is being held to a much higher standard of investment, technical capacity, corporate social responsibility and transparency. Major companies with the capacity to uphold these critical standards recognize pursuing gold mining on the border of the Yellowstone National Park and along the Yellowstone River corridor as a no-win situation. It is time that areas like the gateway to Yellowstone are recognized for their highest and best use in the 21st Century. These uses revolve around pristine landscapes, clean water, unfettered wildlife migrations, public access and a positive visitor experience.

Respectfully Submitted,

Steven Koehler
Manager of Projects, Senior Geologist and QP
7 White Lane
Gardiner, MT 59030

Testimony for Senate Energy and Natural Resources Committee, Subcommittee on Public Lands, Forests, and Mining
In Support Of S. 1548
The Oregon Wildlands Act
August 3, 2017

Big Rock Sports
Cascadia Wildlands
Friends of the Kalmiopsis
Kalmiopsis Audubon
KS Wild
Northwest Rafting Company & ECHO River Trips
Momentum River Expeditions
Northwest Sportfishing Industry Association
Pacific Rivers
Rogue Riverkeeper

Dear Chair Murkowski, Ranking Member Cantwell, and Senator Wyden:

On behalf of the members and supporters of river conservation, fishing organizations and dependent businesses, we thank you for the opportunity to provide testimony in support of S. 1548, the Oregon Wildlands Act. This legislation would benefit specific wild places and rivers of southern Oregon by designating 94,700 acres of Bureau of Land Management (BLM) land as the Rogue Canyon National Recreation Area and approximately 120 miles of waters that flow into the Rogue River as recreational, scenic, or wild under the Wild and Scenic Rivers Act. Additionally, the bill would add 56,000 acres of BLM land to the existing Wild Rogue Wilderness. The waters of the Wild Rogue, old growth forests, and scenic landscapes of southern Oregon are an irreplaceable treasure that support a thriving recreation economy.

There is broad support for the proposed improved protections under this bill, which has been under consideration by the Senate in various iterations for multiple years. Between 2010 and 2017, an estimated 2,400 people wrote letters in support of these protections. This legislation is supported by many local businesses and organizations who have seen the direct and indirect benefits of protecting public lands and wild rivers.

Benefits of Protecting a Wild Rogue

We support improving protections for the Wild and Scenic Rogue River by including he streams that flow into the river. The 84-mile Wild and Scenic stretch of the Rogue River from its confluence with the Applegate River downstream to the Lobster Creek bridge was one of the eight original rivers designated under the Wild and Scenic Rivers Act in 1968.

Protecting the wild Rogue provides multiple benefits to southern Oregon communities and across the state. The Rogue River provides habitat for salmon and steelhead, supporting both the commercial and recreational fishing economies. A 2009 report found that communities across the West Coast enjoy more than $1.5 billion in economic benefit from all salmon and steelhead runs on the Rogue River.[1] Annually, the value of commercial fishing of Rogue River salmon is estimated at $1.4 million and at $16 million for sportfishing.[2] Threats to endangered salmon from harmful land use practices not only put the health of the river at risk, but can reduce the economic benefits of salmon and steelhead in the Rogue for local communities.

The Wild Rogue is internationally recognized for its recreation opportunities, from fishing to boating to hiking. In 2009, river-based recreation on the Wild & Scenic Rogue River, including but not limited to rafting, hiking, and fishing, accounted for an estimated $30 million in economic output and supports 445 full- and part-time jobs.[3] Ninety-one percent of outfitters on the Rogue are based in Oregon. Opportunities to recreate on the river increase the number of visitors and boost the regional economy. For example, three out of every four lodging guests in the area during the Wild Rogue permit season from May through October were visiting the Wild and Scenic Rogue River.[4]

Not only do increased protections under the Wild and Scenic Rivers Act improve the health of the Rogue, but they help to improve the health of our local economies that depend upon tourism and recreation. We support the provisions in S. 1548 to include streams that flow into the Wild Rogue as recreational, wild, and scenic rivers under the Wild and Scenic Rivers Act.

Benefits of Expanding Wilderness and Rogue Canyon National Recreation Area

While the river was one of the original eight Wild and Scenic Rivers designated by Congress in the 1968 Wild and Scenic Rivers Act, only ¼ mile of the area under consideration for wilderness is protected as a Wild and Scenic River. This leaves open the wild canyon for possible harm and threatens the long term viability of the thriving recreation economy that is built around the Wild Rogue. Often called the Zane Grey roadless area after the famed adventure novelist who wrote about the area, this is the largest roadless area managed by the Bureau of Land Management in Western Oregon. Extending wilderness status to the Zane Grey Roadless Area is important to preserving the values of the Wild Rogue.

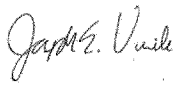
---

[1]Helvoigt, Ted L. and Diane Charlton, 2009, Economic Value of Rogue River Salmon, ECONorthwest, Available online at < http://kswild.org/what-we-do-2/WildlandProtection/RogueSalmonFinalReport.pdf>, p. 1.
[2]Ibid., p. 11-14.
[3] Helvoight, Ted L., et al., 2009, Regional Economic Impacts of Recreation on the Wild and Scenic Rogue River, Available online < https://www.oregonwild.org/sites/default/files/pdf-files/Rogue_Economic_Impact_Report.pdf >, p. 1.
[4] Ibid., p. 1

Establishing the Rogue Canyon National Recreation Area will protect more day use areas on the river outside the wilderness area. Rafting, fishing and hiking in the Wild Rogue Wilderness is a multi-day trip for many visitors, but day trips are very common along the area proposed up-river as a National Recreation Area. For the values and economic benefits described above, we support the designation of a National Recreation Area for the Wild Rogue River.

Thank you for the opportunity to provide testimony in support of S. 1548, the Oregon Wildlands bill.

Sincerely,



Joseph Vaile
Executive Director
KS Wild

Stacey Detwiler
Conservation Director
Rogue Riverkeeper

Liz Hamilton
Executive Director
Northwest Sportfishing Industry Association

Zachary Collier
Owner/Outfitter
Northwest Rafting Company & ECHO River Trips

Pete Wallstrom
Owner/Guide
Momentum River Expeditions

Dave Strahan
Territory Account Manager
Big Rock Sports

John Kober
Executive Director
Pacific Rivers

Barbara Ullian
Friends of the Kalmiopsis

Ann Vileisis
President
Kalmiopsis Audubon Society

Josh Laughlin
Executive Director
Cascadia Wildlands

CC: The Honorable Lisa Murkowski
Chair, Senate Energy and Natural Resources Committee
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member, Senate Energy and Natural Resources Committee
511 Hart Senate Office Building
Washington, DC 20510

The Honorable Mike Lee
Chair, Subcommittee on Public Lands, Forests, and Mining
361A Russell Senate Office Building
Washington, D.C. 20510

The Honorable Ron Wyden
Ranking Member, Subcommittee on Public Lands, Forests, and Mining
221 Dirksen Senate Office Building
Washington, DC 20510

Supporters of the Wild Rogue Legislation

First Name	*Last Name*	*City*	*State*
Dudley	Finch	Clyde	NC
George	Lescher	Ashland	OR
Kathleen	Maloney	Ashland	OR
Allan	Peterson	Ashland	OR
Amber Gayle	Thalmayer	Eugene	OR
Avram	Chetron	Ashland	OR
Susan	Lopez	Ashland	OR
Barbara	Hughey	Applegate	OR
Carla	DAvid	Jacksonville	OR
Ross	Freeman Levin	Portland	OR
Joan	Kalvelage	Ashland	OR
Deborah	Filipelli, Ph.D.	the sea ranch	CA
David	Calahan	Applegate	OR
Debbie	Schlenoff	Eugene	OR
Matthew	Riley	Oakland	OR
Elaine	Wood	Selma	OR
eva	thiemann	jacksonville	OR
Edith	Montgomery	Ashland	OR
George and	Alderson	Catonsville	MD
Erika	Giesen	Talent	OR
George	Sexton	Ashland	OR
Greg	Walter	Cave Junction	OR
John	Bullock	Ashland	OR
Jim	Freeberg	Ashland	OR
Jim	Steitz	Gatlinburg	TN
Gary	Powell	Ashland	OR
John	Gardiner	Cave Junction	OR
Liz	Stiles	Mount Shasta	CA
Scott	Allison	Ashland	OR
Richard	Katz	Ashland	OR
Marion	Hadden	Jacksonville	OR
Lawrence	Nagel	Ashland	OR
Owen	Jurling	Medford	OR
Nancy	Christensen	Ashland	OR
Paul	Torrence	Williams	OR
Glenn Roger	Dorband	Astoria	OR
Ruth	Resch	Ashland	OR
Rick	Sparks	Azalea	OR
Scott	Banddoroff	Ashland	OR
Dave	Willis	Ashland	OR
Spencer	Lennard	Williams	OR
Jamin	Giersbach	Jacksonville	OR

Christy	Fuller	Camdenton	MO
Robyn	Janssen	Ashland	OR
John	MacDiarmid	Central Point	OR
Gene	Koch	Ashland	OR
Joshua	Laughlin	Eugene	OR
Audrey	Moore	Selma	OR
Judy and	Hoyle	Cave Junction	OR
Geraldine	Bish	Talent	OR
Donna	Boyd	Mt. Shasta	CA
David	Teegarden	Ashland	OR
Venita	Varga	Ashland	OR
Tom &	Winter	Ashland	OR
Hannah	Goldberg	Portland	OR
Gary	O'Neal	Gold Hill	OR
David	Mildrexler	Corvallis	OR
Joe	Chasse`	OCEAN PARK	WA
cathy	geiger	portland	OR
Mark	Washington	Seattle	WA
Frank	Hill	Van Nuys	CA
Tom	Dunn	Cave Junction	OR
Melba	Dlugonski	Portland	OR
GC	Panagin	Greensboro	NC
Jim	Fety	Rogue River	OR
Joel	Stewart	Orcas	WA
Amy	Danielson	Portland	OR
Steven	Castro-Shrader	ashland	OR
Larry	Vander Lind	Ashland	OR
Oceanah	D'amore	Talent	OR
Ronald	Little	Ashland	OR
Jan	Brotman	Ashland	OR
Justin	Rohde	Cave Junction	OR
Jennifer	McCoy	Ashland	OR
Kristi	Mergenthaler	Talent	OR
john	bricker	cave junction	OR
Daniel	Cooke	Ashland	OR
onsb	ouby	gstjstj	ot
patrick	young	Fresno	CA
Jim	Goes	Cottage Grove	OR
Carla	Hervert	Eugene	OR
Thomas	Smith	Eugene	OR
Elizabeth	Bretko	Grants Pass	OR
Jeffrey	Yockers	ASHLAND	OR
Philip	Simon	San rafael	CA
e	semon	portland	OR

Sean	Downey	Ashland	OR
Ronald	Weaver	Medford, OR	OR
Adrienne	Simmons	Redding	Ca
Jim	Dawson	Klamath Falls	OR
opie	heyerman	ashland	OR
Christopher	Rodriguez	Redding	CA
Gabriel	Sheridan	Portland	OR
Alden, Denise	Moffatt	Ashland	OR
Courtlandt	Jennings	ashland	OR
Dia	Paxton	Ashland	OR
JAY	RICHARDS	Bend	OR
Justin	Ramsey	euegene	OR
stu	lip	eugene	OR
Marguery Lee	Zucker	Eugene	OR
Mick	B	Eugene	OR
G	LEBLANC	Eugene	OR
vonda	welty	Eugene	OR
Adam	Marlow	Portland	OR
Erik	Olaf	Portland	OR
Jeremy	Kamil	Shreveport	LA
Wandalea	Walker	Kilauea	HI
Donna	Riddle	Eugene	OR
Lila	Spiritwalker	rogue river	OR
Steven	Tichenor	Grants Pass	OR
DENNIS	HONKOMP	FLORISSANT	MO
Jeffry	Hanus	Glorieta	OR
Steve	Schubert	Los Osos	CA
Terry	Raymer	Eureka	CA
sean	peterson	eugene	OR
Eric	Peterson	Central Point	OR
Lars	Limburg	Cave Junction	OR
Beth	Grendahl	Kennewick	WA
Erich	Thalmayer	Eugene	OR
Miles	Barger	Eugene	OR
Jill	Talise	Kerby	OR
Jack	Neff	Los Angeles	CA
Kathryn	Sonenshine	Ashland	OR
Ben	Bellinson	Ashland	OR
Joslin	Fritz	north adams	MA
Scott	Sonenshine	Ashland	OR
Valentine	Jones	Ashland	OR
Jessica	Martin	Portland	OR
David	Edwards	Eugene	OR
Michael	Heyn	Lake Oswego	OR

Mary	Kwart	Ashland	OR
Randy	Pearson	Champaign	IL
heather	faith	ashland	OR
Susan	Dunaway	Grants Pass	OR
Dennis	Davie	Capitola	CA
Jared	Parmer	Grants Pass	OR
Martha	Shelley	Portland	OR
Rochelle	Nelson	Seattle	WA
Jacob	Pounds	Arcata	CA
Christopher	Pond	Roseburg	OR
Fred	Fleetwood	Trail	OR
Paul	West	Ashland	OR
Frances	Dunham	Ashland	OR
Nina	Council	Ashland	OR
Michael	Meister	Talent	OR
Dominique	Brown	Ashland	OR
Steve	Anthes	Malo	WA
Richard	Tetley	Eugene	OR
Jan	McCreary	Silver City	NM
Mary	Camp	Selma	OR
Theresa	Bush	Medford	OR
Doug	Butler	Painted Post	NY
Mary	Buddenhagen	Azalea	OR
Gaylene	Hurley	Medford	OR
Walt	Mintkeski	Portland	OR
David	Olson	Cambridge	IL
Annie	Walsh	AShland	OR
Amanda	Alford	Ashland	OR
M.L.	Moore	Ashland	OR
Pepper	Trail	Ashland	OR
Nina	Cucchiari	Ashland	OR
Tony	Brussat	Central point	OR
kati	tomlinson	ashland	OR
Greg	Guevara	Medford	OR
David	Lawrence	Springfield	OR
Susan	Lander	Ashland	OR
Ron	Pio	Cave Junction	OR
steve	pringle	BROOKINGS	OR
Arlene	Dreste	Ajo	AZ
Michael	Connor	Livingston	TX
Kate	Cleland-Sipfle	Ashland	OR
Robert	Minney	Rogue River	OR
pat	lind	Shasta lake	CA
darren j welsh	welsh	las vegas	NV

Anna	Beauchamp	Ashland	OR
Frank	Wetmore	Gold Beach	OR
Pat	Russell	Springfield	OR
Phoebe	Parker-Shames	Cave Junction	OR
Ginger	MacKenzie	Ashland	OR
Mary	Lyda	Cave Junction	OR
Richard	Yerby	Grants Pass	OR
David	Wilson	Mountain View	CA
Kevin	Silvey	Seminole	FL
David	Stowe	Del Mar	CA
Anthony	Capobianco	Bethel Park	PA
Davud	Waber	Klamath Falls	OR
Michael	Chapman	Brooklyn	NY
Ann	Hollyfield	Seal Rock	OR
angela	fazzari	portland	OR
martha	leahy	winchester	MA
Steve	Sheehy	Klamath Falls	OR
Ben	Ruwe	Felton	CA
Shane	Daugherty	Coos Bay	OR
Stan	Schmokel	Portland	OR
Caroline	Skinner	Portland	OR
Joyce	Frohn	Oshkosh	WI
Tami	Palacky	Springfield	VA
John	Witte	Portland	OR
Basey	Klopp	Bend	OR
Stephen	Bachhuber	Happy Valley	OR
paul	burke	virginia beach	va
Charleynne	Gates	Eugene	OR
Kimberly	Peterson	Cloverdale	CA
M	McGillivary	Eugene	OR
Steve	Edwards	Fitchburg	MA
Candy	LeBlanc	Placerville	Califirnia
rhonda	lawford	south	IL
Victoria	Vining-Gillman	Portland	OR
Eileen	Cooper	Crescent City	CA
Sue	Beilke	Tigard	OR
sam	smith-rowe	grants pass	OR
Mark	Holmgren	St. Petersburg	FL
Chris	Drumright	Murfreesboro	TN
Lynette	Dumont	Golden	CO
Natalie A.	Carter	Newark	OH
Mervi	Rantala	Tampere	Finland
Patricia	Lovejoy	Helix	OR
Pat	Shade	Newport	OR

Pam	Haunschild	Ashland	OR
Pam	Moore	Talent	OR
Whitsitt	Goodson	Eugene	OR
Elizabeth	Cohen	Fall Creek	OR
John	Herberg	Eugene	OR
Kelly	O'Connor	Ashland	OR
Dawn	Garcia	Bend	OR
Ivan	Phillipsen	Portland	OR
Jill	Iles	Talent	OR
Barbara	Comnes	Ashland	OR
Clyde	Wilson	Applegate	OR
Bud	Erland	Portland	OR
Carol	Hupp	Jacksonville	FL
james	Walker	Janesville	WI
Michael	Nacrelli	Clackamas	OR
Kristy	Mitchell	Carrollton	TX
Elisabeth	Bechmann	St Poelten	ot
Ana	R	Zagreb	ot
deborah j	volk	cincinnati	OH
Fran	Fulwiler	Portland	OR
talila	stan	tel aviv	ot
Ira	Mak	Jerusalem	ot
Kelle	Herrick	Bandon	OR
Aiyana	Green	Ashland	OR
Jon	Kimball	Ashland	OR
Fred	Fall	Cherry Hill	NJ
Michael	Kirkby	Toronto	ON
david	chuse	Ashland	OR
maryen	herrett	ashland	OR
Paul	Brown	Grants Pass	OR
Clarence	Sanders	Bozeman	MT
Brian	Beinlich	North Plains	OR
Richard	Borovicka	Gearhart	OR
rev james	Evans	Phoenix	OR
Carol	Richardson	Medford	OR
Susanna	DeFazio	walton	OR
William	Holmes	Ashland	OR
Meyer	George	Klamath Falls	OR
Donna	Webb	Ashland	OR
Heike	Minervini	Cave Junction	OR
Suzanne	Seiber	Ashland	OR
Libba	Coker	ashland	OR
Christopher	Smith	Coatesville	PA
Maya	Moore	Ashland	OR

Suzanne	Savoie	Jacksonville	OR
Fred	Lifton	portland	OR
John and	Stoltenberg	Elkhart Lake	WI
Paul	Norup	Brookings	OR
Nyack	Clancy	Manhattan	NY
Elena	Kalmykova	New York	NY
Pia	Mustonen	Tampere	ot
Jelica	Roland	Buzet	None
Alison	Arnold	Essex	ot
alicia	vazquez	madrid	ot
Rev. Fred	Keip	Grants Pass	OR
Robert	Glass	Oak Park	IL
Chuck	Brushwood	Omak	WA
Zach	Hubbird	Eugene	OR
benjamin	tackett	Denver	CO
Trevor	Woolman	Eugene	OR
Kasson	Kauth	Ashland	OR
neil	mingledorff	Tampa	FL
Beatrice	Broughton	Avondale	PA
Jim	Franklin	Central Point	OR
two dudes	fly fishing	Eugene	OR
david	moen	Portland	OR
Lee	Connah	Baltimore	MD
James	Roberts	Palouse	WA
Mark	Mueller	Denver	CO
JEANNINE	MAZO	CORPUR	TX
Sheila	Decker	Eugene	OR
Mette	Jensen	Eugene	OR
sarah	furber	Portland	OR
Matthew	Pintar	Lubbock	TX
Gracie	Winters	Newkirk	OK
Stan	Taylor	Eugene	OR
Audrey	Colombe	Tidewater	OR
Eric	Sol	Ashland	OR
Denise	Lytle	Fords	NJ
Dean	Thompson	Irving	TX
Rain	Rigge	Ashland	OR
Doug	Viner	Ashland	OR
Bob	Morris	weaverile	CA
Jayne	Goodwin	Crescent	OR
Richard	Stickle	Ashland	OR
Elden	Parchim	Cave Junction	OR
Barbara	Eels	Gold Beach	OR
Natalie	Johnson	Arlington	VA

Alyssa	Walker	Portland	OR
Dan	Beausoleil	Williams	OR
Ann	Cobban	Redmond	OR
Rob	Harvey	Bend	OR
nicolette	ludolphi	GrÃ¶pelingen	AE
Andrea	Nemec	/	ot
Sara	Paoluzzi	Sacile	ot
Brenda	Amick	Talent	OR
Mary	Cody	Ashland	OR
Jason	Bowman	Placerville	CA
Candy	Bowman	Placerville	CA
donold	Burger	brookings	OR
Cassidy	Joy	Lake Oswego	OR
Donald	Smith	Cave Junction	OR
Cynthia	Edwards	Rogue River	OR
Anne	Mack	Mercer Island	WA
John	Riha	Ashland	OR
Matthew	Kaminker	Portland	OR
brad	niva	Merlin	OR
Beverly	Moore	Merlin	OR
JOAN	FLEMING	shelbyville	TN
Kathy	Dolan	Wheaton	IL
Amy	Elston	Glen Carbon	IL
Edith	Coleman	Wilmington	DE
Al	Abrams	Findlay	OH
Judy	Weaver-Mark	Grants Pass	OR
Lisa	Kelz	Cave Junction	OR
Patrick	wegner	albany	OR
Susan Jane	Brown	Portland	OR
Richard	Chasm	Dillard	OR
Evelyn	Thompson	Ashland	OR
Carol	Hanrahan	Roseburg	OR
len	richardson	wolf creek	OR
Henry	Caswell	Phoenix	OR
Gordon	Longhurst	Grants Pass	OR
Debra	Cleland	Ashland	OR
Greg	Hatten	Eugene	OR
Sam	Drevo	Portland	OR
Joe	Hyer	Olympia	WA
Dave	Slover	Hood River	OR
Sandra	Wiese	Cheshire	OR
Laura	FArner	Salem	OR
Chris	Ray	Parma	OH
Chantal	Buslot	Hasselt	ot

Yee Yean	Lim	Seri	ot
Beate	Michl	Munich	ot
Jill	Vickerman	Yzerfontein	ot
Lisa	Neste	High Point	NC
Danuta	Watola	Kalety	ot
Rita	Kerkhofs	Antwerpen	ot
John	Livingston	Redding	CA
Henri	De Decker	Tisselt	ot
Gary	Hughes	Arcata	CA
Chavala	Bates	Grants Pass	OR
Megan	Fehrman	Jacksonville	OR
Andrew	Taylor	Ashland	OR
cristiano	pinnow	Lewisville	TX
Lynne	Matejcek	Ashland	OR
Kelly	Rucker	Lexington	SC
Kathy	Chadwell	Lafayette	IN
Victoria	Molinari	Poulsbo	WA
Dominic	Delarmente	Pasay	ot
Birgitta	Siponen	Oulu	ot
Annie	Wei	Queenslnad	NC
Yvonne	Fast	Aalborg	ot
Judy	Krach	Hazel Crest	IL
June	Cattell	West Columbia	SC
kx	bx	lanc	CA
Valerie	Hildebrand	Parma	OH
Alison	Baker	Swansea	IL
Dru Ann	Delgado	Munhall	PA
Larry	Tomlinson	Long Beach	CA
peter	faure	tarxien	CA
Elena	Belikova	Chicago	IL
nicole	silva	haverhill	MA
Cynthia	Gross	Ashland	OR
Stacey	Rohrbaugh	Willits	CA
Jerry	Sullivan	Mount Shasta	CA
Hugh	Lentz	Olympia	WA
Susan	Sinotte	Whitehorse	YT
Linda	Hughes	Portland	OR
Ana	Sonata	VI	ot
Gloria	Cameron	New Castle	PA
Nuno	Correia	Seixal	RI
Kenneth	Lapointe	Ottawa	ON
Agnes	Jean	Valreas	ot
Kathleen	Beavin	Bothell	WA
Jane	Mailloux	Portland	OR

Eve	Saglietto	Seeshaupt	ot
Debi	Mohan	Miami	FL
Ingrid	Cerqueni	Trieste	ot
Ewa	Piasecka	Warsaw	ot
Gillian	Miller	Bracknell	ot
Dennis	McNally	New Straitsville	OH
Lidia	Feliciano	ALAMEDA	CA
Candi	Ausman	Fremont	CA
Beverly	Gannon	london	CA
mary	rojeski	SANTA	CA
Barbara	blackburn	Portland	OR
Julien Kaven	Parcou	Victoria	ot
Gayla J.	Gatling	Waxahachie	TX
nancy	o	newark	DE
Toni	Adisano	Brooklyn	NY
Nancy	McIntyre	Regina	SK
amelie	laurent	la flotte	ot
R	B	Escondido	CA
Bridgett	Cuffe	Ashland	OR
John	Holloway	Ashland	OR
Ted and Mary	Warrick	Grants Pass	OR
Chad	Derosier	Ashland	OR
Don	Walton	Ashland	OR
Eric	Kresh	Pittsburgh	PA
Maria	sarris	Athens, Greece	ot
Jeannine	Mihalek	Beavercreeek	OR
Debbie	Thomas	Fernley	NV
joyce	schwartz	altamonte	FL
Laura	Manges	Berea	KY
Bronwen	Evans	Vancouver	WA
Doug	Landau	St Petersburg	FL
Michael	MacIntyre	Laughlin	NV
Lorenz	Steininger	stafford	VA
Ricardo	Corrales	Heredia, Costa	CO
Kate	Kenner	Jamaica Plain	MA
Kimberly	Wiley	Rochester	NY
Gary	Gilardi	Hood River	OR
Kathleen	Wolfe	Des Moines	WA
JOHN	PASQUA	Escondido San	CA
Maureen	ONeal	PORTLAND	OR
Serena	Wittkopp	Portland	OR
Alice	McGough	E Falmouth	MA
Mallika	Henry	Cambridge	NY
John	Moszyk	St Louis	MO

Hal	Trufan	Matthews	NC
dan	cappello	lawrence	PA
Phyllis	Mollen	New york	NY
mauricio	carvajal	Santiago	ot
Tessa	Sibbet	Placerville	CA
Brian	Kwiatkowski	Cincinnati	OH
Linda	Hanson	The Dalles	OR
stefan	koch	baltimore	MD
Erik	Meldrum	Pleasant Hill	CA
Jim	Stout	Happy Valley	OR
Ellen	Gutfleisch	Sussex	WI
Bennett	Pearson	Clinton	WA
Tim	Gibbins	Portland	OR
Angela	Wyble	Talent	OR
Paula	Musich	ashland	OR
Ralph	Bowman	Central Point	OR
Lee	Calvert		
Randall	Smith	Omaha	NE
Acacia	Lacy	Ashland	OR
Abraham	Karam	Tempe	AZ
kate	mount	grants pass	OR
Peggy	Rebol	Cottonwood	CA
Michele	Mercer	Casa Grande	AZ
mr	seldom	Gold Hill	OR
Brenda	Collins	London	NY
James	Feldmann	Corvallis	OR
Wolfgang	Rudolf		OR
Barbara	Holifield	Mill Valley	CA
Dennis	Pennell	Vancouver	WA
Andrew	Seles	Ashland	OR
George	Sutherland	San Clemente	CA
Whitney	Eure	Asheville	NC
Andrew	Mason	Talent	OR
Jennifer	Harris	Hood RIver	OR
Alyssa	Hausman	Alexandria	VA
Stuart	Perillo	Fort Collins	CO
Dianne	Mackin	Grants Pass	OR
Denise	Brown	Merlin	OR
S. Colleen	Walch	Gold Hill	OR
carter	rose	Wolf Creek	OR
john	rogers	Ashland	OR
Jon	Mellgren	Central Point	OR
Dianne	Reum	Grants Pass	OR
John & Janice	Limb	Ashland	OR

Steve	Chroningei	Merlin	OR
Drew	Irby	Mission Viejo	CA
Linda	Bellinson	Ashland	OR
Megan	Janssen	Ashland	OR
Jan	Janssen	Ashland	OR
stuart	o'neill	Ashland	OR
Suzanne	Grossmann	Ashland	OR
Anne	Koch	Portland	OR
Karen	Smith	Ashland	OR
Beverly	Bacak	Port Orford	OR
Patricia	Halleran	Ashland	CA
Kris	DeMaria	Portland	OR
Bob	Dingethal	Portland	OR
Niel	Lawrence	Olympia	WA
deb	buckley	Portland	OR
Erin	Jimenez	Central Point	OR
Jeff	Juel	Spokane	WA
Sheri	Jacob	Rogue River	OR
Shelley	Lotz	Ashland	OR
Ben	Wright	Eugene	OR
joseph	armstrong	o'brien	ore.
Lana	Obie	Bothell	WA
Barbara	McGarrah	Medford	OR
Edwin	Marvin	Cave Junction	OR
Jared	White	Corvallis	OR
Kathy	Gikkasoue	Grants pass	OR
Ben & Sally	Benjamin	Ashland	OR
Andrew	Linger	Avon	CO
Mary	Watson	Boise	ID
David	Ghelfi	Eugene	OR
robert	orcutt	Crescent	OK
Margy	Nickelson	Eagle Point	OR
Jennifer	Self	Seattle	WA
Octavia	Stradford	Bend	OR
Lori	Major	Holladay	UT
Jeff	Hunter	Chattanooga	TN
Peter	Grossmann	Ashland	OR
Lynda	Cue	Ashland	OR
Jacqueline	Green	Bandon	OR
Alex	Weber	Hillsboro	OR
Tara	Cottle	Ashland	OR
Daniel	Horton	milwaukie	OR
Jim	McMillen	Grants Pass	OR
Aaron	Theisen	Spokane	WA

Cecilia	Watson	Central Point	OR
Lori	Levine	Grants Pass	OR
Sam	Gressett	Portland	OR
David	Trageser	Portland	OR
Harlan	Walker-Young	Jacksonville	OR
Tim	Brink	Sandy	OR
Sarah	Miller	vancouver	WA
Cameron	La Follette	Salem	OR
Allen	Sayble	Ashland	OR
HP	Lovell	Grants Pass	OR
Paul	Kuthe	Portland	OR
Scott	Edwards	SWARTHMORE	PA
jessamyn	johns	portland	OR
George	Neste	High Point	NC
Dejah	Leger	Shoreline	WA
Jane	Van Dyke	Ashland	OR
David	Johnson	Sedro-Woolley	WA
paul	goff	o'brien	OR
Greg	Davenport	Ridgefield	WA
Jerry	Williams	Spokane	WA
gary	brensdal	Beaverton	OR
Jay	Humphrey	Estacada	OR
Christy	Ivory	Ashland	OR
Hanne	Hoppe	Central Point	OR
Gordon	Lyford	O'Brien	OR
Mary	Yount	Ashland	OR
Lyla	Emery	Portland	OR
Scott	Dunn	Oregon City	OR
Barbara	Ullian	Grants Pass	OR
Carmon	Thomas	Philomath	OR
Elena	DeLisle	Shoreline	WA
Sheena	Keavney	Portland	OR
Sheryl	Gerety	Davis	CA
Russ	Thomas	Creswell	OR
Sam	Reese	Portland	OR
cathy	hughes	kerby,	OR
Jordan	Lanz	Portland	OR
Scott	Baker	portland	OR
Charlotte	Peterson	Central Point	OR
Cari	Eisler	Portland	OR
Fran	Eastman	Ashland	OR
Kevin	Janssen	Portland	OR
Ryan	Turner	Grangeville	ID
Gail	Pearlman	Grants Pass	OR

Beth	Anderson	Medford	OR
Amy	Johnson	Delaware	OH
John	Loehrer	Gresham	OR
Dr Nancy D	Bonazzoli	Grants Pass	OR
Cici	Brown	Ashland	OR
shannon	Cornish	Medford	OR
Earl	Peterson	Central Point	OR
Nancy	Fleischman	Applegate	OR
James	Keskimaki	Eugene	OR
CATHY	FREEMAN	ASHLAND	OR
matt	moreland	sandy	OR
Eileen	Amaranthus	Grants Pass	OR
Peter	Gibb	ashland	OR
Carrie	Robertson	Jacksonville	OR
Ira	Munkvold	Portland	OR
Courtney	Neron	Portland	OR
Carol	Putnam	Central Point	OR
Clayton	Gillette	Medford	OR
robert	scott	Ashland	OR
Sandy	Tracy	Medford	OR
Frederick	Gant	Ashland	OR
jo	wayles	Ashland	OR
Michelle	Lamoreaux	rhododendron	OR
Rebecca	Pierce	Astoria	OR
David	Frank	Gold Hill	OR
Linda	Ford	Grants Pass	OR
Allen	Gillette	Albany	OR
John	Johnson	Hixson	TN
Duane	Short	Tempe	WY
Dustin	briedwell	Portland	OR
Robb	Keller	Vancouver	WA
Catherine	Dennerlein	Grants Pass	OR
david	darby	ashland	OR
Robert	Janssen	ASHLAND	OR
David	Lorenzen	Grants Pass	OR
ursula	robichaud	medford	OR
Paul	Christensen	Ashland	OR
Ken	Barker	Tigard	OR
Geoffrey	Becker	Applegate	OR
Jeffrey	White	Forest Grove	OR
Brienne	Blacklidge	Oregon City	OR
Leland	Hanson	Portland	OR
Ryan	Slagle	Portland	OR
Kim	Ingvaldson	Grants Pass	OR

Margaret	Cochrane	Medford	OR
Cheryl	Ford	Happy Valley	OR
Carol	McCutcheon	Medfor	OR
ron	kay	oceanside	CA
gloria	stone	Ashland	OR
Gabe	Strand	Seattle	WA
Peter	Gandesbery	Ashland	OR
martha	marvin	Junction City	OR
Kris	Schmidt	medford	OR
patricia	hume	ashland	OR
Reese	Haydon	Grants Pass	OR
DEANNA	GOSSNER	Medford	OR
Lisa	Waters	Arcata	CA
Richard and	Streng	ashland	OR
lloyd	knapp	ashland	OR
Lynn	Funk	Williams.Or.	OR
Patricia	Barry	Portland	OR
Kelly	Green	Cave Junction	OR
Ann	Cuddy	Ashland	OR
Michael	Cerbone	Portland	OR
cody	hiestand	portland	OR
Emmet	Band	Eugene	OR
michael	fitzgerald	Ashland	OR
Jacqueline	Taylor	Medford	OR
JAMES	DRAEGER	Portland	OR
Frances	Adams	Ashland	OR
Annette	Drager97535	Phoenix	OR
Charles	Hall	Eugene	OR
Michele	Brown-Riding	Grants Pass	OR
Christine	Gardener	Cave Junction	OR
Gloria	Schwartz	Ashland	OR
Timothy	Stetz	Cave Junction	OR
Patricia	McFadden-	Ashland	OR
Jeremy	Blau	Jacksonville	OR
Jim	Massey ND	Potland	OR
linda	kappen	Applegate	OR
chris	pin	talent	OR
Dyan	Larson	Rockford	IL
Lorna	Pearman	Dexter	OR
Jenna	Patterson	Lynnwood	WA
Renate	hOGAN	Medford	OR
Kathleen	Byrne	Phoenix	OR
M	Smith	Salem	OR
Jadwiga	Reinke	Redding	CA

Jesse	Wakeley	Eugene	OR
Benton	Elliott	Eugene	OR
Susan	Herzog	Eugene	OR
kieran	walsh	Eugene	OR
Tobias	Policha	Eugene	OR
Amy	Atwood	Portland	OR
Barbara	Hetland	Ashland	OR
Charmaine	Rehg	Eugene	OR
Barb	Shamet	Allegany	OR
Toby	Kubler	EUGENE	OR
Loretta	Huston	Cottage Grove	OR
Dana	Furgerson	Eugene	OR
Steve	Barnes	Cottage Grove	OR
Firelin	Jones	Eugene	OR
Peter	Jensen	Benson	VT
Alice	Pace	Cave Junction	OR
Barbara	Tada	Cottage Grove	OR
Kathleen	Kliewer	Grants Pass	OR
EDMUND	GLOVINSKY	Grants Pass	OR
Sara	Burant	Eugene	OR
Noah	Marquis	Sherwood	OR
Rebecca	Jamieson	Portland	OR
david	monk	Eugene	OR
tenaya	gilman	myrtle creek	OR
Alice	Stroud	Eugene	OR
Maretta	Stiles	Pasadena	CA
Lisa	Byers	Merlin	OR
joanne	costantino	Ashland	OR
Mary M.	Grant	Springfield	OR
James	Lanz	Vancouver	WA
Catherine	Boucher	Eugene	OR
Kathrin	Strieby	Hillsboro	OR
Tresa	Beaver	Eugene	OR
Lori	Carty	Monterey Park	CA
Alex	Lanz	Vancouver	WA
Miles	Uchida	Portland	OR
Jennifer	Gerrard	Eugene	OR
Marilyn	Wilbur	Central Point	OR
H. M.	Sustaita	Eugene	OR
Nancy	Mendenhall	Medford	OR
Louise	Shawkat	Ashland	OR
Barbara	Braunstein	Selma	OR
Willa	Gustavson	Cave Juntion	OR
Susanne	Krieg	Ashland	OR

Jessica	Elledge	Springfield	OR
Marianne	Jessop	Ashland	OR
Maria	Holloway	Medford	OR
Richard	Skidmore	Gainesville	FL
Mary	Gabriele	Cottage Grove	OR
Jennifer	Davis	Ashland	OR
Emily	Minah	Talent	OR
Pauline	Grant	Manchester	NH
Ben	Clark	Portland	OR
W Bruce	Wright	Ashland	OR
corine	cathala	Pierrelatte	ot
Jarrod	Kaplan	Eugene	OR
Riley	Morgan	McMinnville	OR
Matthew	Estes	Springfield	OR
Kathleen	Cortapassi	Grants Pass	OR
Grant	Whipp	Redding	CA
Albert	Honican	Winter Haven	FL
Jonathan	Huhn	Lawrenceville	GA
Jennifer	Natali	Berkeley	CA
Scott	Coryell	Lees Summit	MO
Patrick	Wilson	Grants Pass	OR
Henry	DeGuc Jr.	Grants Pass	OR
Tami	Workinger	Grants Pass	OR
D.	Smith	Grants Pass	OR
Amy	More	Williams	OR
Merry	Schmidt	Grants Pass	OR
Brittany	Hayes	Rogue River	OR
Robin	Elliott	Grants Pass	OR
Meghan	Bost		
Rob	Locher	Merlin	OR
Teresa	Wicks	Ashland	OR
Julie	Bacon	Eugene	OR
Mark	Jordan	Eugene	OR
Snake	Harrington	Springfield	OR
Jens	Odegaard	Corvallis	OR
Erica	Champagne	victoria	BC
Jasmina	Cuk	Solna	NY
Audrey	Shapiro	Medford	OR
Sean	Corrigan	Trinity Beach	CA
Ellen	Goodman	Riverside	RI
nokomis	callender	coos bay	OR
Rebecca	Lorang	Williams	OR
amy	schumacher	beavercreek	OH
Setsuko	Maruki-fox	Grants Pass	OR

Casey	Schnaible	Medford	OR
Chad	Hymel	Los Angeles	CA
Diana	Dorsett	Fort Worth	TX
Ramona	Bennett	Grants Pass	OR
Andrew	Brown	Portland	OR
David	Blain	BEND	OR
Melinda	Wright	Covington	GA
kevin	sewell	nottingham	NY
Sylwia	Dawidek	Cracow	ot
Ulrike	MacKay	Wilhelmsthal	ot
CINDY	ZIMMERMANN	IMPERIAL	CA
christelle	coudyser	pÃ©gomas	ot
Jeff	Scroggin	Portland	OR
Christopher	Evans	Near Byton	ot
beate	dietrich	Colorado	CO
sue	schÃ¼mmer	Ulm	DE
Darla	Rehmer	Medford	OR
David	Modarelli	Akron	OH
clifford/christin	schmutz	boonton	NJ
Deidre	Hunter	Flagstaff	AZ
Cary	Thompson	Eugene	OR
Kelley	Pascoe	Oakland	CA
Susan	Stover	Winters	CA
John	Pascoe	Winters	CA
Nicole	Weber	Pasadena	MD
michela	messineo	Roma ITALY	ot
sian	richards	SWANSEA	ot
Will	Sears	Talent	OR
Vadim	Melerzanov	Brooklyn	NY
levi	van meter	albany	OR
Roger	Funk	Talent	OR
Dave	Lacey	Gold Beach	OR
Peter	Xebic	S.F.	CA
Theo	Black	San Bernardino	CA
Petra	Hegenscheidt	Essen	ot
Elizabeth	Whelan	London	FL
nicky	williams	dorset	ot
Marian	Madsen	Competa	ot
Tina	Sprecker	Weeze	ot
Lori	Orton	Grants Pass	OR
Kristyna	Stuchlikova	Susice	ot
Jenny	Andersson	GÃ¤vle	ot
Evelyn	Roether	Williams	OR
Konrad	Klamath	Somes Bar	CA

Lesley	Adams	Talent	OR
Marcia	Denison	Rainier	OR
peggy	peters	champions	FL
Taylor	Brown	Ashland	OR
Michael	Bullington	Eugene	OR
Oscar	Kimbrough	Eugene	OR
frank	sprouse	Eugene	OR
Arden	Prehn	Talent	OR
Jon	Carlson	Ashland	OR
Dagmar	Grabsch	Berlin	FL
Emily	Romero	Murphy	ID
Will	Volpert	Ashland	OR
Hester	Goedhart	Dayboro	ot
Carol	Ampel	Medford	OR
Janet	Walker	Selma	OR
Dakota	Otto	Ashland	OR
Heidi & Jim	Parker-Shames	Ashland	OR
Marian	Crumme	Ashland	OR
David & Leann	Tourzan	Ashland	OR
Starla	Flores	canby	OR
Bert	Fox	Portland	OR
Donna	Swanson	Ashland	OR
Karen	Horn	Ashland	OR
Dave	Maize	Cave Junctioin	OR
kathy	ging	eugene	OR
Randy	Weaver	Eureka	CA
Jeffrey	Thompson	Medford	OR
Arlene	Aron	Jacksonville	OR
Laurel	Merchant	ashland	OR
Tyler	Kappen	Ashland	OR
Ayani	Mikasi	Talent	OR
deborah	delaunay	Ashland	OR
Beth	Nolan	Ashland	OR
Mary	Ehlers	ASHLAND	OR
Bob	Thomas	Myrtle Creek	OR
Statia	Ryder	Port Orford	OR
John	Bowden	Springfield	OR
Kay	Fontaine	Grants Pass	OR
Koeby	Johnson	Ashland	OR
Christine	Yee	Gold Hill	OR
James and	Diefenderfer	Cave Junction	OR
Rachel	Goodman	Cave Junction	OR
janet	huntamer	O Brien	OR
Paul	Howard	Corvallis	OR

Nina	Horsley	CJ	OR
Brent	Jensen	Hillsboro	OR
Tyler	Flaming	Grants pass	OR
Gage & Tyler	Flaming	Grants pass	OR
Robert	Mumby	Phoeix	OR
Marcia	Rodine	Ashland	OR
Pat	Bath	Grants Pass	OR
Emmalyn	Garrett	Grants Pass	OR
Mary	Conroy	Selma	OR
Hal	Anthony	Grants Pass	OR
Patricia	Vazquez	Mexico City	ot
David	Councilman	Saint Louis	MN
William	Gates	Ashland	OR
Lee	Gelatt	Grand Junction	CO
Michael	Dean	North Bend	OR
Raja	Anderson	S.F.	CA
Michelle	Waters	Los Gatos	CA
desanka	sandulovic	belgrade	ot
Dennis	Kasunic	Portland	OR
Joseph	Vaile	Ashland	OR
Carol & Clark	Custodio	Ashland	OR
Tom	Dimitre	Ashland	OR
Ann	Vileisis	Port Orford	OR
Katherine	Luscher	Portland	OR
David	Saul	Eugene	OR
paula	praskievicz	portland	OR
Steve	Kingsford	Hood River	OR
Stan	Easley	Brookings	OR
Mike	Klem	Grants Pass	OR
Danielle & Don	Wirth	Woodward	IA
Dave	Maher	Ashland	OR
Daniel	Belachew	Cambridge	MA
Jake	Crawford	Ashland	OR
Alison	Laughlin	Ashland	OR
Jonathan	McLaughlin	Talent	OR
clea	arthur	Talent	OR
Tracy	Harding	Ashland	OR
Jade	Sevelow	Phoenix	OR
Michael	Orloff	Yreka	CA
Jeffrey	Case	Vancouver	WA
Lynette	Crighton	North Webster	IN
Mary Sloan	Roby	Baltimore	MD
Gabriela	Stocks	Gainesville	FL
Francesca	Pardo	Baltimore	MD

Scott	Rion	Placerville	CA
Jamie	Wright	Portland	OR
Hayley	Ward	Eagle Point	OR
jonathan	eisenberg	neeedham	MA
Erin	Flynn	Victor	ID
Dana	Woodruff	Ashland	OR
Paul	Korbulic	Gold Hill	OR
A.M.	Stone	portland	OR
Barbara	Will	Gold Canyon	AZ
Laura	Dalton	Portland	OR
Jane	Barton	Asland	OR
George	Sorvalis	Takoma Park	MD
Naomi	Lipper	Ashland	OR
Ellen	Craine	Ashland	OR
Jennifer	Hirsh	Studio City	CA
Joel	Frank	gold hill	OR
Matthew	Burt	Medford	OR
Matthew	Shore	Phoenix	OR
Leslie	Crabtree	Ashland	OR
Laura	Rogers	Ashland	OR
darrel	pearce	ashland	OR
Charles	Gehr	Ashland	OR
Susan	McKennon	Ashland	OR
Chandra	LeGue	Eugene	OR
Nicholas	Lougee	SPRINGFIELD	OR
Alecia	Walker	Ashland	OR
Deborah	Mokma	Ashland	OR
James	Minervini	Ashland	OR
Jennifer	Lance	Hyampom	CA
Melanie	Jessee	Grants Pass	OR
Dee	Decker	Ashland	OR
Rueben	Davis	Talent	OR
Ted	Kennel	Millbrae	CA
elizabeth	eggers	ashland	OR
Nathaniel	Jenks	Ashland	OR
Wayne	Kelly	Ashland	OR
Leslie	Cox	Gold Hill	OR
Pamela	Lucas	Ashland	OR
Dick	Artley	Grangeville	ID
Maura	Hayes	Ashland	OR
Jonathan	Spero	Grants Pass	OR
Shannon	Bartow	Eugene	OR
Julia	Burwell	Bellevue	WA
Elaine	Woodriff	Petaluma	CA

Rylan	Heyerman	Ashland	OR
Betsey	Norton	CAve Junction	OR
Kathy	Escott	Williams	OR
Benjamin	Mercer	Liberty	VA
Louis	Smith	Medford	OR
Carley	Beilfuss	Ashland	OR
Derek	Severson	Medford	OR
D'Averil	Ibbotson	Hillsboro	OR
Wendell	Wood	Chiloquin	OR
Matt	Sloat	Corvallis	OR
Paul	Jerskey	Seattle	WA
Robert and	Freeman	Eugene	OR
Margot	Fetz	Eugene	OR
Gudrun	Dennis	Gainesville	FL
Aeronica	Ferguson	Oklahoma City	OK
Emily	Skibinski	ashland	OR
Shelby	Dias	Ashland	OR
Don	Barshis	Wilmette	IL
Robert	Rodriguez	Los Angeles	CA
Sarah	Baraff	Portland	OR
Lisa	Ryan	Colgate	WI
jean	kimball	ashland	OR
Shira	Mendes de	Ashland	OR
Moreland	Smith	Talent	OR
Kyla	Zaret	Missoula	OR
Peter	Lawson	Newport	OR
David &	Kalstad	Eugene	OR
Nancy	Nichols	Deadwood	OR
Gradey	Proctor	Portland	OR
Patricia	Brewer	Ashland	OR
Alexander	Maksymowicz	Medford	OR
Bridget	Riceci	Tucson	AZ
douglas	schoellkopf	Cave Junction	OR
Jim	Rich	Cave Junction	OR
Eugenia Jo	Regan	Lancaster	CA
gina	hall	orinda	CA
Van & Eva	Howell	Riverhead	NY
Kathy	Patterson	Salem	OR
Jonathan	Bowers	Portland	OR
Dickson	Slater	Redding	CA
Alison	Huber	Grants Pass	OR
John and Polly	Wood	Hood River	OR
Jason	Reynolds	Portland	OR
Beth	Levin	Ashland	OR

m	garvin	westfir	OR
Chris	Jackson	Cottage Grove	OR
Charles	Mcsweeney	Cave Junction	OR
Derek	Volkart	Talent	OR
Gayla	Barrows	Medford	OR
Lauren	Taylor	Ashland	OR
Martha	Abshear	Ashland	OR
Sam	Simpson	Ashland	OR
Sara	Katz	Williams	OR
Susan	Goracke	Grants Pass	OR
Rod	Rochambeau	Eugene	CA
Jay	Lininger	Talent	OR
Ted	Padgett	Vancouver	WA
bryan	yarberry	berwyn	IL
Teena Jo	Neal	Grants Pass	OR
Brian	Hudgins	Wilbur	OR
Mick	Bress	Gold Beach	OR
Linda	Zercher	Selma,	OR
Ron and Lynn	Laupheimer	Talent	OR
Krislyn	Dillard	springfield	OR
Herb	Long	Ashland	OR
Carl	Washburn	River Forest	IL
Steve	Rouse	Grants Pass	OR
Toni	Siegrist	cambridge	MA
Jason	Margulis	Ashland	OR
Mike	Allen	Troutdale	OR
Kathy	Seabrook	Vancouver	WA
Toby	Brown	Jacksonville	OR
paul	safady	williams	OR
Judith	Schlacter	Eugene	OR
Russ	Yttri	hudson	WI
Alex	Landt	Ashland	OR
Akissi	Goffinet	Ashland	OR
Corina	Aleman	Springfield	OR
melinda	ball	Lawrence	KS
Gretchen	Hillard	Ashland	OR
Julia	McFadden	Ashland	OR
Susan	Viani	Ashland	OR
ANDY	PIRRELLO	medford	OR
Christine	Takaoka	Selma	OR
Matthew	Carlstroem	Kensington	CA
Martin	Albert, M.D.	Charlottesvle	VA
Nick	Hendricks	Weed	CA
brent	small	portland	OR

Sarah	McElroy	Birmingham	AL
Annette	Simonson	Albany	OR
Stan	Dalegowski	O Brien	OR
michelle	bienick	Williams	OR
Nancy	Fisher	The Dalles	OR
Deborah &	Houshour	Myrtle Point	OR
John	Minoletti	Igo	CA
dana	delashmutt	gold hill	OR
Dennis	Ely	Portland	OR
Susan	Skinner	Astoria	OR
Sydney	Carothers	Arcata	CA
Dave	Cavner	Rogue River	OR
Elaine	Weiss	Eugene	OR
Sandra M.	Willmore	New Albany	OH
Alan	Gregory	Conyngham	PA
Mason	Hall	Tigard	OR
Tom	Alexander	Wilderville	OR
elizabeth	wilson	noblesville	IN
Lisa	Moscinski	Portland	OR
Aaron	Nelson	Eugene	OR
Sara CA	Rafter	Yachats	OR
Teri	Manley	Seattle	WA
Amy	Elbert	Fremont	CA
Joseph	Warren	Portland	OR
chris	hewitt	kirkland	WA
John	Deitch	Florence	OR
Philip	Gremaud	Ashland	OR
don	wagner	eugene	OR
Marc	Gauthier	Spokane	WA
Herve	Perreault	Williams	OR
Stephanie	Miranda-	Las Vegas	NV
Melinda	Buckner	Indianapolis	IN
Veronica	Miller	Veneta	OR
Jane	Ujhazi	Bandon	OR
Bryan	Farland	Des Moines	IA
Andrew	Schneller	Saratoga	NY
Leslie	Larson	Shady Cove	OR
Kristin	Clague	Pella	IA
sepora	jacobson	ashland	OR
Marilee	Koll	portland	OR
Andrew	Kuhlberg	Canton	CT
Kay	Martin	Cleveland	OH
Hazel	Reagan	O'Brien	OR
Anita	Corliss-Heggen	laquinta	CA

Rose	Demoret	Reno	NV
Karla	Williams	Portland	OR
Leslie	Wingate	Williams	OR
Joya	Feltzin	Cave Junction	OR
Brandie	Haigler	Beaverton	OR
Justin	Bailie	Wheeler	OR
Elinor	Gollay	Portland	OR
Andrea	Beardsley	Eugene	OR
Jennifer	Woodbridge	Port Townsend	WA
Wendy	Hambidge	Portland	OR
Leslie	Logan	Portland	OR
Juel	Mathews	Portland	OR
Jason	Quigley	Portland	OR
Jack	Viscardi	Eugene	OR
Mark	Van Ryzin	Eugene	OR
Todd	Lewis	Corvallis	OR
Christina	Campbell	Greensboro	NC
Jamie	Brandtner	GRESHAM	OR
Tony	Howard	Portland	OR
Kathy	Gregory	Gold Beach	OR
Elaine	Hultengren	Salem	OR
Lydia	Hazlett	Salem	OR
Cathryn	Chudy	Vancouver	WA
Daniel	Hefko	Midlothian	VA
Colleen	Klaum	Allentown	PA
Kenny	Vaher	NYC	NY
Cher	Clarke	London	ON
Sue	Harrington	St.Paul	MN
Wendye	Kolles	St Louis	MO
NANCY	BILLINGS	EDGEWOOD	MD
kayla	hodges	loxahatchee	FL
tara	lav	brooklyn	NY
Valerie	Sherrill	boardman	OH
Maria	F.	Vr	ot
Suzanne	Sparling	Phoenix	AZ
Rebecca	Bednarz	Lincoln	NE
Peggy	Acosta	womelsdorf	PA
echo	greenfield	ashland	OH
Pamela	Johnson	Lake Village	IN
r	m	portland	OR
Benjamin	Zumeta	Crescent City	CA
Anne	Mcneely-Foley	Mentor	OH
Michael	Coe	Portland	OR
John	Coleman	Springville	AL

kim	bauer	lancaster	CA
Deanna	Zimmerman	Atlanta	GA
steven	Wagner	Portland	OR
Gabriela	Garcia	Sauk Village, Ill.	IL
Tierney	Grinavic	Huntingtown	MD
Jessie	Humphrey	Paulden	AZ
Scott	Spiker	Beaverton	OR
Nina	Serman	Holland	MI
Debb	Lovett	confidential	IL
Rhonda	Maness	Horton	AL
Jerry	Smith	Eugene	OR
LIANA	PRISCHENKO	PORTLAND	OR
Ellyn	Sutton	Spokane	WA
robin	rigoli	Salem	OR
Lucy	Wingate	Atlanta	GA
Sherman	Waring	Oak Grove	OR
Jennifer	Wells	Portland	OR
Barbara	DelGiudice	Burien	WA
thomas	clark	los angeles	CA
Tom	Maxwell	Los Angeles	CA
Cecile	Valastro	Sherwood	OR
Mark	Hanschka	Sunriver	OR
Joy	Bergstrom	Wake Forest	NC
Margaret	Mitchell	Portland	OR
Dominic	lovato	Gresham	OR
Douglas	Williamson	Sherwood	OR
Mark	Sheridan	Eugene	OR
Andrew	Jurash	Albany	OR
will	roush	Portland	OR
Michael	Denham	Portland	OR
Mario	Fregoso	Medford	OR
terry	seitz	RIDGEFIELD	WA
Lynn	Nourse	Santa Cruz	CA
Belinda	Hollingsworth	Fremont	CA
warren	hollingsworth	fremont	CA
Kristin	Seate	medford	OR
harmony	doughten	el sobrante	CA
Linda	Browning	Beaverton	OR
cynthia	barlow	astoria	OR
Jenessa	Dragovich	Dexter	OR
Jaymi	Bucklew	Eugene	OR
Cynthia	Ignatovich	Portland	OR
Suzanne	Feldman	Lake Oswego	OR
Kathleen	Kline	Portland	OR

Rebekah	Seal_LaPlante	Pepeekeo	HI
S	D	beaverton	OR
Tea	Coiner	Medford	OR
Hayley	Broughton	Rogue River	OR
Josh	Armagost	Portland	OR
Jeff	Acree	Hillsboro	OR
Noah	Cervantes	Philomath	OR
Glenda	Phillips	Selah	WA
Stephan	Wickham	Merlin	OR
Anne	Gay	Ashland	OR
Jean	Kaiwi	San Diego	CA
Amber	Shelton	Arcata	CA
MARC	LEUTHOLD	PORTLAND	OR
M. E.	Braun	Corvallis	OR
Andrea	Scharf	Yachats	OR
Sarah	Vaile	Ashland	OR
cat	koehn	fall creek	OR
Donna	Dove	Ashland	OR
Mark	Takaro	Berkeley	CA
Kenneth	Stern	Cave Junction	OR
Erin	Moore	Bellingham	WA
Brenda	Schweitzer	Talent	OR
Zac	Kauffman	Phoenix	OR
David	Tourzan	Ashland	OR
Heidi	Dawn	Ashland	OR
Kari	Rein	Williams	OR
Harold	Christiansen	Lincoln City	OR
Susan	Orris	Merlin	OR
Daniel	Wise	Talent	OR
Rene	Voss	San Anselmo	CA
Melanie	Mindlin	Ashland	OR
Victoria	Richert	Huntington	CA
Cheryl	Bruner	Williams	OR
Catherine	Larkin	Ashland	OR
Barrett	Edgar	Wedderburn	OR
Keri	Green	Ashland	OR
Christopher	Kane	Mount Shasta	CA
Deb	Fox	Williams	OR
Mark	Wienert	North Bend	OR
Mervin	Witt	Talent	OR
Steve	Thomas	Ashland	OR
Graham	Morey	Nevada City	CA
Wayne	Reilly	Ashland	OR
Bruce	Donelson	Selma	OR

Grant	Ruiz	Ashland	OR
Leona	Wobbe	Medford	OR
Jackson	Meadows	Klamath Falls	OR
JORDAN	BECKETT	ASHLAND	OR
Marc	Ratner	Ashland	OR
Maximiliaan	Michels	Bourbonnais	IL
Allan	Miles	Ashland	OR
Christine	Ashrow	Ashland	OR
Jeff	Jackson	Roseburg	OR
Mike	Mahlstadt	Fort jones	CA
Lori	Kegler	San Pedro	CA
Heather	Lewis	Phoenix	OR
f	mangels	mt shasta	CA
Martin	Hanley	dunsmuir	CA
Natalie	Johnson	Ashland	OR
Andrea	Frank	Beach Park	IL
Linda	Jones	CORNVILLE	ON
Cathy	Greer	Daytona Beach	FL
Gretchen	Hanger	New Hope	MN
Aleksander	Lindemann	Krsko	NY
Julia	Jones	Grants Pass	OR
Shawn	Sorensen	Portland	OR
Anne	Settanni	Normal	IL
Lucy	Kelly	London	AR
Matthew	Messner	Ashland	OR
Hailee	Nueva	Bend	OR
John	Woolley	Sequim	WA
Jutta	Nowakowska	Torun	ot
Judyta	Dymkowska	Wroclaw	ot
Gary	Church	Aldershot. Qld.	ot
Brakha	Lav	Brooklyn	NY
Brenda	Towers	Durham	ot
pjpfwozfb	pjpfwozfb	WzvpZqmnUeS	GA
Pete	Wallstrom	Ashland	OR
Wendy	Forster	Manchester	ot
William	Ward	Eugene	OR
Glenn	Cross	Williams	OR
Robert	Barker	Shady Cove	OR
Dudley	Finch	Clyde	NC
George	Lescher	Ashland	OR
Kathleen	Maloney	Ashland	OR
m	garvin	westfir	OR
patrice	tullai	southworth	WA
Allan	Peterson	Ashland	OR

Amber Gayle	Thalmayer	Eugene	OR
Avram	Chetron	Ashland	OR
Chris	Jackson	Cottage Grove	OR
Susan	Lopez	Ashland	OR
Barbara	Hughey	Applegate	OR
Carla	DAvid	Jacksonville	OR
Carol & Clark	Custodio	Ashland	OR
Charles	Mcsweeney	Cave Junction	OR
Ross	Freeman Levin	Portland	OR
Joan	Kalvelage	Ashland	OR
Derek	Volkart	Talent	OR
Deborah	Filipelli, Ph.D.	the sea ranch	CA
Tom	Dimitre	Ashland	OR
Deborah	Mokma	Ashland	OR
David	Calahan	Applegate	OR
James	Minervini	Ashland	OR
Debbie	Schlenoff	Eugene	OR
Cynthia	Edwards	Rogue River	OR
Matthew	Riley	Oakland	OR
Elaine	Wood	Selma	OR
eva	thiemann	jacksonville	OR
Braith	Birchhall	Ashland	OR
Edith	Montgomery	Ashland	OR
Gayla	Barrows	Medford	OR
George and	Alderson	Catonsville	MD
Erika	Giesen	Talent	OR
George	Sexton	Ashland	OR
Greg	Walter	Cave Junction	OR
John	Bullock	Ashland	OR
Jim	Freeberg	Ashland	OR
Jim	Steitz	Gatlinburg	TN
Jennifer	Lance	Hyampom	CA
Gary	Powell	Ashland	OR
John	Gardiner	Cave Junction	OR
Lauren	Taylor	Ashland	OR
William	Nuessle	Ashland	OR
Liz	Stiles	Mount Shasta	CA
Scott	Allison	Ashland	OR
Richard	Katz	Ashland	OR
Martha	Abshear	Ashland	OR
Melanie	Jessee	Grants Pass	OR
Marion	Hadden	Jacksonville	OR
Lawrence	Nagel	Ashland	OR
Dee	Decker	Ashland	OR

Owen	Jurling	Medford	OR
Nancy	Christensen	Ashland	OR
Paul	Torrence	Williams	OR
Glenn Roger	Dorband	Astoria	OR
Ruth	Resch	Ashland	OR
Rick	Sparks	Azalea	OR
Rueben	Davis	Talent	OR
Sam	Simpson	Ashland	OR
Sara	Katz	Williams	OR
Scott	Banddoroff	Ashland	OR
Susan	Goracke	Grants Pass	OR
Dave	Willis	Ashland	OR
Spencer	Lennard	Williams	OR
Ted	Kennel	Millbrae	CA
Tom	Peil	Ashland	OR
elizabeth	eggers	ashland	OR
Rod	Rochambeau	Eugene	CA
Nathaniel	Jenks	Ashland	OR
Wayne	Kelly	Ashland	OR
John	Weatherman	Los Angeles	CA
Daniel	Wise	Talent	OR
Jamin	Giersbach	Jacksonville	OR
Christy	Fuller	Camdenton	MO
Robyn	Janssen	Ashland	OR
Jay	Lininger	Talent	OR
John	MacDiarmid	Central Point	OR
Gene	Koch	Ashland	OR
Rene	Voss	San Anselmo	CA
Joshua	Laughlin	Eugene	OR
Audrey	Moore	Selma	OR
Leslie	Cox	Gold Hill	OR
Judy and	Hoyle	Cave Junction	OR
Geraldine	Bish	Talent	OR
Donna	Boyd	Mt. Shasta	CA
Richard G.	Chenoweth,	Ashland	OR
Pamela	Lucas	Ashland	OR
Melanie	Mindlin	Ashland	OR
David	Teegarden	Ashland	OR
Victoria	Richert	Huntington	CA
Venita	Varga	Ashland	OR
Debra	Zaslow	Ashland	OR
Tom &	Winter	Ashland	OR
Ted	Padgett	Vancouver	WA
bryan	yarberry	berwyn	IL

Hannah	Goldberg	Portland	OR
Gary	O'Neal	Gold Hill	OR
Jeffrey	White	Portland	OR
Ann	Vileisis	Port Orford	OR
David	Mildrexler	Corvallis	OR
Joe	Chasse`	OCEAN PARK	WA
cathy	geiger	portland	OR
Mark	Washington	Seattle	WA
Teena Jo	Neal	Grants Pass	OR
John	Koenig	Eugene	OR
Dick	Artley	Grangeville	ID
Frank	Hill	Van Nuys	CA
Tom	Dunn	Cave Junction	OR
Melba	Dlugonski	Portland	OR
Cheryl	Bruner	Williams	OR
GC	Panagin	Greensboro	NC
Jim	Fety	Rogue River	OR
Constance	Palaia	Grants Pass	OR
Hata	Hill	Portland	OR
Joel	Stewart	Orcas	WA
Brian	Hudgins	Wilbur	OR
Amy	Danielson	Portland	OR
Steven	Castro-Shrader	ashland	OR
Larry	Vander Lind	Ashland	OR
Bonnie	Shaffer	Ashland	OR
Oceanah	D'amore	Talent	OR
Mick	Bress	Gold Beach	OR
Ronald	Little	Ashland	OR
Jan	Brotman	Ashland	OR
Justin	Rohde	Cave Junction	OR
Linda	Zercher	Selma,	OR
Ron and Lynn	Laupheimer	Talent	OR
Krislyn	Dillard	springfield	OR
Heidi	Wolfe	Jacksonville	OR
Herb	Long	Ashland	OR
Carl	Washburn	River Forest	IL
Barrett	Edgar	Wedderburn	OR
Keri	Green	Ashland	OR
Jennifer	McCoy	Ashland	OR
Maura	Hayes	Ashland	OR
Christine	Kleiman	Ashland	OR
Kristi	Mergenthaler	Talent	OR
Steve	Rouse	Grants Pass	OR
john	bricker	cave junction	OR

Daniel	Cooke	Ashland	OR
tangren	Alexander	Ashland	OR
onsb	ouby	gstjstj	ot
Toni	Siegrist	cambridge	MA
patrick	young	Fresno	CA
Jim	Goes	Cottage Grove	OR
Christopher	Kane	Mount Shasta	CA
Maureen	Hicks	Ashland	OR
Carla	Hervert	Eugene	OR
Thomas	Smith	Eugene	OR
Elizabeth	Bretko	Grants Pass	OR
Jeffrey	Yockers	ASHLAND	OR
Philip	Simon	San rafael	CA
Brad	smith	eugene	OR
e	semon	portland	OR
Sean	Downey	Ashland	OR
Ronald	Weaver	Medford, OR	OR
Adrienne	Simmons	Redding	Ca
Jim	Dawson	Klamath Falls	OR
David	Lane	Ashland	OR
Ian	Torrence	Flagstaff	AZ
Deb	Fox	Williams	OR
Jason	Margulis	Ashland	OR
opie	heyerman	ashland	OR
Jonathan	Spero	Grants Pass	OR
Christopher	Rodriguez	Redding	CA
Gabriel	Sheridan	Portland	OR
Alden, Denise	Moffatt	Ashland	OR
Courtlandt	Jennings	ashland	OR
Dia	Paxton	Ashland	OR
Jo Anne	Stone	Cave Junction	OR
Gloria	Nash	monroe	CT
Shannon	Bartow	Eugene	OR
JAY	RICHARDS	Bend	OR
Thea	Evenstad	Eugene	OR
Justin	Ramsey	euegene	OR
stu	lip	eugene	OR
Mike	Allen	Troutdale	OR
Marguery Lee	Zucker	Eugene	OR
Mick	B	Eugene	OR
G	LEBLANC	Eugene	OR
vonda	welty	Eugene	OR
Adam	Marlow	Portland	OR
Erik	Olaf	Portland	OR

Julia	Burwell	Bellevue	WA
Jeremy	Kamil	Shreveport	LA
Kathy	Seabrook	Vancouver	WA
Toby	Brown	Jacksonville	OR
Wandalea	Walker	Kilauea	HI
Donna	Riddle	Eugene	OR
Elaine	Woodriff	Petaluma	CA
paul	safady	williams	OR
Lila	Spiritwalker	rogue river	OR
Judith	Schlacter	Eugene	OR
Shannon	McBride	Eugene	OR
Steven	Tichenor	Grants Pass	OR
DENNIS	HONKOMP	FLORISSANT	MO
Jeffry	Hanus	Glorieta	OR
Steve	Schubert	Los Osos	CA
Terry	Raymer	Eureka	CA
sean	peterson	eugene	OR
Mark	Wienert	North Bend	OR
Eric	Peterson	Central Point	OR
Lars	Limburg	Cave Junction	OR
Beth	Grendahl	Kennewick	WA
Jason	Goldenrose	Eugene	OR
Erich	Thalmayer	Eugene	OR
Elizabeth	Kelly	Portland	OR
Miles	Barger	Eugene	OR
Erin	Zabroski	Corvallis	OR
Ruby	Mahr	gold hill	OR
Mary Lou	Massey	Sierra Vista	AZ
Pamela	Beaumonte	Escondido	CA
Bethany	Lamarre	Lambs Gardn	OR
Robin	Hunting	Gold Beach	OR
julie	smith	Portland	OR
Brittany	Crider	Portland	OR
Miriam	Howard	Medford	OR
Mervin	Witt	Talent	OR
David	Hodson	Talent	OR
Adam	Farmer	N Hollywood	CA
Jim	Oxyer	Louisville	KY
Russ	Yttri	hudson	WI
Lisa	Shunn	Medford	OR
Melanie	Ross	Rogue River	OR
Kory	Goold	Portland	OR
Alex	Landt	Ashland	OR
shelley	knop	Sacramento	CA

Steve	Thomas	Ashland	OR
Jill	Talise	Kerby	OR
Akissi	Goffinet	Ashland	OR
Sherry	Straus		OR
Sarah	Hulslander	Gold Beach	OR
Stephen	Kern	Grants Pass	OR
Katherine	Luscher	Portland	OR
Rylan	Heyerman	Ashland	OR
Jack	Neff	Los Angeles	CA
Amanda	Cushman	Madison	WI
Karen	Wilson	Eagle Point	OR
Kathryn	Sonenshine	Ashland	OR
Ben	Bellinson	Ashland	OR
Colleen	McNally-	Watsonville	CA
Betsey	Norton	CAve Junction	OR
Joslin	Fritz	north adams	MA
Scott	Sonenshine	Ashland	OR
Jaime	Foland	Troutdale	OR
Kathy	Escott	Williams	OR
Valentine	Jones	Ashland	OR
Laurel	Herrman	Grants Pass	OR
Kelsey	Helgeson	Eagle Point	OR
Jessica	Martin	Portland	OR
David	Saul	Eugene	OR
Ann	Macrory	Ashland	OR
David	Edwards	Eugene	OR
Corina	Aleman	Springfield	OR
John	Altshuler	Eugene	OR
Stephen	Kish	Ashland	OR
Doug	Gillingham	Medford	OR
Michael	Heyn	Lake Oswego	OR
Jeff	Helfrich	Vida	OR
Mary	Kwart	Ashland	OR
Rich	Wilkinson	Gold Hill	OR
Jason	Pollard		OR
Ben	Bansen		OR
Jake	Hagadone	Vancouver	WA
Benjamin	Mercer	Liberty	VA
Randy	Pearson	Champaign	IL
heather	faith	ashland	OR
Randy	Rasmussen	Corvallis	OR
Diane	Kish	Ashland	OR
Lee	Saadat	Brookings	OR
Don	Guy		OR

Jeff	Hogg	Eugene	OR
Alva	Brentmar		OR
Susan	Dunaway	Grants Pass	OR
Louis	Smith	Medford	OR
drew	peterson	folsom, ca	CA
Dennis	Davie	Capitola	CA
Jared	Parmer	Grants Pass	OR
Susan	Baird	Ashland	OR
Wade	Arndt	Eugene	OR
Martha	Shelley	Portland	OR
Rochelle	Nelson	Seattle	WA
Carley	Beilfuss	Ashland	OR
melinda	ball	Lawrence	KS
Jacob	Pounds	Arcata	CA
Christopher	Pond	Roseburg	OR
Fred	Fleetwood	Trail	OR
Paul	West	Ashland	OR
Graham	Morey	Nevada City	CA
Wayne	Reilly	Ashland	OR
Gretchen	Hillard	Ashland	OR
Frances	Dunham	Ashland	OR
Nina	Council	Ashland	OR
Julia	McFadden	Ashland	OR
Susan	Viani	Ashland	OR
Michael	Meister	Talent	OR
Dominique	Brown	Ashland	OR
Steve	Anthes	Malo	WA
ANDY	PIRRELLO	medford	OR
Christine	Takaoka	Selma	OR
Richard	Tetley	Eugene	OR
Jan	McCreary	Silver City	NM
sarah	mayer	cave junction	OR
Matthew	Carlstroem	Kensington	CA
Martin	Albert, M.D.	Charlottesvle	VA
Mary	Camp	Selma	OR
Derek	Severson	Medford	OR
Theresa	Bush	Medford	OR
Nick	Hendricks	Weed	CA
brent	small	portland	OR
Sarah	McElroy	Birmingham	AL
Doug	Butler	Painted Post	NY
D'Averil	Ibbotson	Hillsboro	OR
Bruce	Donelson	Selma	OR
Mary	Buddenhagen	Azalea	OR

Gaylene	Hurley	Medford	OR
Walt	Mintkeski	Portland	OR
Wendell	Wood	Chiloquin	OR
Annette	Simonson	Albany	OR
Grant	Ruiz	Ashland	OR
Stan	Dalegowski	O Brien	OR
David	Olson	Cambridge	IL
Matt	Sloat	Corvallis	OR
michelle	bienick	Williams	OR
Annie	Walsh	AShland	OR
Amanda	Alford	Ashland	OR
Nancy	Fisher	The Dalles	OR
M.L.	Moore	Ashland	OR
Leona	Wobbe	Medford	OR
Pepper	Trail	Ashland	OR
Nina	Cucchiari	Ashland	OR
Tony	Brussat	Central point	OR
kati	tomlinson	ashland	OR
Deborah &	Houshour	Myrtle Point	OR
John	Minoletti	Igo	CA
Paul	Jerskey	Seattle	WA
dana	delashmutt	gold hill	OR
Diane	Floyd	cave junction	OR
Suzanne	Immonen	Ferndale	WA
Josh	Woolley	Beaverton	OR
Carol	Mcbride	Cave junction	OR
Greg	Guevara	Medford	OR
Dennis	Ely	Portland	OR
Susan	Skinner	Astoria	OR
Sydney	Carothers	Arcata	CA
Dave	Cavner	Rogue River	OR
Elaine	Weiss	Eugene	OR
David	Lawrence	Springfield	OR
Sandra M.	Willmore	New Albany	OH
Alan	Gregory	Conyngham	PA
Susan	Lander	Ashland	OR
Ron	Pio	Cave Junction	OR
steve	pringle	BROOKINGS	OR
Arlene	Dreste	Ajo	AZ
Robert and	Freeman	Eugene	OR
Mason	Hall	Tigard	OR
Michael	Connor	Livingston	TX
Kate	Cleland-Sipfle	Ashland	OR
Robert	Minney	Rogue River	OR

Tom	Alexander	Wilderville	OR
Margot	Fetz	Eugene	OR
elizabeth	wilson	noblesville	IN
Lisa	Moscinski	Portland	OR
Jackson	Meadows	Klamath Falls	OR
pat	lind	Shasta lake	CA
Aaron	Nelson	Eugene	OR
darren j welsh	welsh	las vegas	NV
Sara CA	Rafter	Yachats	OR
Teri	Manley	Seattle	WA
Amy	Elbert	Fremont	CA
paula	praskievicz	portland	OR
Joseph	Warren	Portland	OR
Steve	Kingsford	Hood River	OR
Anna	Beauchamp	Ashland	OR
chris	hewitt	kirkland	WA
John	Deitch	Florence	OR
Frank	Wetmore	Gold Beach	OR
Stan	Easley	Brookings	OR
Pat	Russell	Springfield	OR
Phoebe	Parker-Shames	Cave Junction	OR
Philip	Gremaud	Ashland	OR
don	wagner	eugene	OR
Marc	Gauthier	Spokane	WA
Herve	Perreault	Williams	OR
Stephanie	Miranda-	Las Vegas	NV
Melinda	Buckner	Indianapolis	IN
Veronica	Miller	Veneta	OR
Jane	Ujhazi	Bandon	OR
Bryan	Farland	Des Moines	IA
Andrew	Schneller	Saratoga	NY
Leslie	Larson	Shady Cove	OR
Kristin	Clague	Pella	IA
sepora	jacobson	ashland	OR
Marilee	Koll	portland	OR
Andrew	Kuhlberg	Canton	CT
Kay	Martin	Cleveland	OH
Hazel	Reagan	O'Brien	OR
Anita	Corliss-Heggen	laquinta	CA
Ginger	MacKenzie	Ashland	OR
Rose	Demoret	Reno	NV
Mary	Lyda	Cave Junction	OR
Karla	Williams	Portland	OR
Richard	Yerby	Grants Pass	OR

Leslie	Wingate	Williams	OR
David	Wilson	Mountain View	CA
Joya	Feltzin	Cave Junction	OR
Brandie	Haigler	Beaverton	OR
Kevin	Silvey	Seminole	FL
Justin	Bailie	Wheeler	OR
David	Stowe	Del Mar	CA
Elinor	Gollay	Portland	OR
Anthony	Capobianco	Bethel Park	PA
Davud	Waber	Klamath Falls	OR
Andrea	Beardsley	Eugene	OR
Michael	Chapman	Brooklyn	NY
Ann	Hollyfield	Seal Rock	OR
Jennifer	Woodbridge	Port Townsend	WA
angela	fazzari	portland	OR
martha	leahy	winchester	MA
Steve	Sheehy	Klamath Falls	OR
Ben	Ruwe	Felton	CA
Wendy	Hambidge	Portland	OR
Leslie	Logan	Portland	OR
Juel	Mathews	Portland	OR
Shane	Daugherty	Coos Bay	OR
Jason	Quigley	Portland	OR
Stan	Schmokel	Portland	OR
Jack	Viscardi	Eugene	OR
Mark	Van Ryzin	Eugene	OR
Todd	Lewis	Corvallis	OR
Caroline	Skinner	Portland	OR
Christina	Campbell	Greensboro	NC
Jamie	Brandtner	GRESHAM	OR
Tony	Howard	Portland	OR
Gudrun	Dennis	Gainesville	FL
Joyce	Frohn	Oshkosh	WI
Tami	Palacky	Springfield	VA
John	Witte	Portland	OR
Kathy	Gregory	Gold Beach	OR
Elaine	Hultengren	Salem	OR
Basey	Klopp	Bend	OR
Lydia	Hazlett	Salem	OR
Cathryn	Chudy	Vancouver	WA
Stephen	Bachhuber	Happy Valley	OR
paul	burke	virginia beach	va
Charleynne	Gates	Eugene	OR
Kimberly	Peterson	Cloverdale	CA

M	McGillivary	Eugene	OR
Steve	Edwards	Fitchburg	MA
Daniel	Hefko	Midlothian	VA
Colleen	Klaum	Allentown	PA
Kenny	Vaher	NYC	NY
Cher	Clarke	London	ON
Sue	Harrington	St.Paul	MN
Candy	LeBlanc	Placerville	Califirnia
Wendye	Kolles	St Louis	MO
NANCY	BILLINGS	EDGEWOOD	MD
kayla	hodges	loxahatchee	FL
tara	lav	brooklyn	NY
Valerie	Sherrill	boardman	OH
Maria	F.	Vr	ot
Suzanne	Sparling	Phoenix	AZ
Rebecca	Bednarz	Lincoln	NE
Peggy	Acosta	womelsdorf	PA
echo	greenfield	ashland	OH
Pamela	Johnson	Lake Village	IN
r	m	portland	OR
Benjamin	Zumeta	Crescent City	CA
Anne	Mcneely-Foley	Mentor	OH
Michael	Coe	Portland	OR
John	Coleman	Springville	AL
kim	bauer	lancaster	CA
Deanna	Zimmerman	Atlanta	GA
steven	Wagner	Portland	OR
Gabriela	Garcia	Sauk Village, Ill.	IL
Tierney	Grinavic	Huntingtown	MD
Jessie	Humphrey	Paulden	AZ
rhonda	lawford	south	IL
Victoria	Vining-Gillman	Portland	OR
Aeronica	Ferguson	Oklahoma City	OK
Scott	Spiker	Beaverton	OR
Nina	Serman	Holland	MI
Eileen	Cooper	Crescent City	CA
Sue	Beilke	Tigard	OR
sam	smith-rowe	grants pass	OR
Debb	Lovett	confidential	IL
Rhonda	Maness	Horton	AL
Mark	Holmgren	St. Petersburg	FL
Jerry	Smith	Eugene	OR
LIANA	PRISCHENKO	PORTLAND	OR
Ellyn	Sutton	Spokane	WA

Chris	Drumright	Murfreesboro	TN
robin	rigoli	Salem	OR
Lynette	Dumont	Golden	CO
Lucy	Wingate	Atlanta	GA
Sherman	Waring	Oak Grove	OR
Jennifer	Wells	Portland	OR
Barbara	DelGiudice	Burien	WA
thomas	clark	los angeles	CA
Natalie A.	Carter	Newark	OH
Tom	Maxwell	Los Angeles	CA
Cecile	Valastro	Sherwood	OR
Mark	Hanschka	Sunriver	OR
Joy	Bergstrom	Wake Forest	NC
Margaret	Mitchell	Portland	OR
Dominic	lovato	Gresham	OR
Douglas	Williamson	Sherwood	OR
Mark	Sheridan	Eugene	OR
Andrew	Jurash	Albany	OR
will	roush	Portland	OR
Michael	Denham	Portland	OR
Mario	Fregoso	Medford	OR
Mervi	Rantala	Tampere	Finland
terry	seitz	RIDGEFIELD	WA
Lynn	Nourse	Santa Cruz	CA
Belinda	Hollingsworth	Fremont	CA
Patricia	Lovejoy	Helix	OR
warren	hollingsworth	fremont	CA
Emily	Skibinski	ashland	OR
Kristin	Seate	medford	OR
Pat	Shade	Newport	OR
harmony	doughten	el sobrante	CA
Pam	Haunschild	Ashland	OR
Linda	Browning	Beaverton	OR
Shelby	Dias	Ashland	OR
Don	Barshis	Wilmette	IL
cynthia	barlow	astoria	OR
Jenessa	Dragovich	Dexter	OR
Pam	Moore	Talent	OR
Whitsitt	Goodson	Eugene	OR
Elizabeth	Cohen	Fall Creek	OR
Jaymi	Bucklew	Eugene	OR
John	Herberg	Eugene	OR
Cynthia	Ignatovich	Portland	OR
Kelly	O'Connor	Ashland	OR

Dawn	Garcia	Bend	OR
Suzanne	Feldman	Lake Oswego	OR
Ivan	Phillipsen	Portland	OR
Jill	Iles	Talent	OR
Barbara	Comnes	Ashland	OR
Clyde	Wilson	Applegate	OR
Kathleen	Kline	Portland	OR
Rebekah	Seal_LaPlante	Pepeekeo	HI
Bud	Erland	Portland	OR
JORDAN	BECKETT	ASHLAND	OR
Carol	Hupp	Jacksonville	FL
james	Walker	Janesville	WI
Michael	Nacrelli	Clackamas	OR
Kristy	Mitchell	Carrollton	TX
Elisabeth	Bechmann	St Poelten	ot
Ana	R	Zagreb	ot
deborah j	volk	cincinnati	OH
Fran	Fulwiler	Portland	OR
talila	stan	tel aviv	ot
Ira	Mak	Jerusalem	ot
Robert	Rodriguez	Los Angeles	CA
Kelle	Herrick	Bandon	OR
Sarah	Baraff	Portland	OR
Aiyana	Green	Ashland	OR
Lisa	Ryan	Colgate	WI
Jon	Kimball	Ashland	OR
jean	kimball	ashland	OR
Shira	Mendes de	Ashland	OR
Fred	Fall	Cherry Hill	NJ
Michael	Kirkby	Toronto	ON
david	chuse	Ashland	OR
Moreland	Smith	Talent	OR
maryen	herrett	ashland	OR
Kyla	Zaret	Missoula	OR
Paul	Brown	Grants Pass	OR
Clarence	Sanders	Bozeman	MT
Peter	Lawson	Newport	OR
David &	Kalstad	Eugene	OR
Nancy	Nichols	Deadwood	OR
Gradey	Proctor	Portland	OR
Patricia	Brewer	Ashland	OR
Brian	Beinlich	North Plains	OR
Richard	Borovicka	Gearhart	OR
Alexander	Maksymowicz	Medford	OR

rev james	Evans	Phoenix	OR
Bridget	Riceci	Tucson	AZ
douglas	schoellkopf	Cave Junction	OR
Carol	Richardson	Medford	OR
Susanna	DeFazio	walton	OR
Jim	Rich	Cave Junction	OR
William	Holmes	Ashland	OR
Meyer	George	Klamath Falls	OR
Eugenia Jo	Regan	Lancaster	CA
gina	hall	orinda	CA
Donna	Webb	Ashland	OR
Van & Eva	Howell	Riverhead	NY
Heike	Minervini	Cave Junction	OR
Kathy	Patterson	Salem	OR
Marc	Ratner	Ashland	OR
S	D	beaverton	OR
Suzanne	Seiber	Ashland	OR
Libba	Coker	ashland	OR
Jonathan	Bowers	Portland	OR
Dickson	Slater	Redding	CA
Tea	Coiner	Medford	OR
Christopher	Smith	Coatesville	PA
Alison	Huber	Grants Pass	OR
Maya	Moore	Ashland	OR
Suzanne	Savoie	Jacksonville	OR
Fred	Lifton	portland	OR
John and	Stoltenberg	Elkhart Lake	WI
Hayley	Broughton	Rogue River	OR
Josh	Armagost	Portland	OR
Jeff	Acree	Hillsboro	OR
Noah	Cervantes	Philomath	OR
Paul	Norup	Brookings	OR
Nyack	Clancy	Manhattan	NY
Elena	Kalmykova	New York	NY
Pia	Mustonen	Tampere	ot
Jelica	Roland	Buzet	None
Alison	Arnold	Essex	ot
alicia	vazquez	madrid	ot
Rev. Fred	Keip	Grants Pass	OR
Robert	Glass	Oak Park	IL
Ronald	Atwood	Portland	OR
Chuck	Brushwood	Omak	WA
Zach	Hubbird	Eugene	OR
benjamin	tackett	Denver	CO

Trevor	Woolman	Eugene	OR
Kasson	Kauth	Ashland	OR
neil	mingledorff	Tampa	FL
Beatrice	Broughton	Avondale	PA
Wayne	Lannin	Port Orford	OR
Jim	Franklin	Central Point	OR
two dudes	fly fishing	Eugene	OR
david	moen	Portland	OR
Lee	Connah	Baltimore	MD
James	Roberts	Palouse	WA
Mark	Mueller	Denver	CO
JEANNINE	MAZO	CORPUR	TX
Sheila	Decker	Eugene	OR
Mette	Jensen	Eugene	OR
Dave	Strahan	GRANT PASS	OR
Cathy	Seitz	Medford	OR
sarah	furber	Portland	OR
Matthew	Pintar	Lubbock	TX
Gracie	Winters	Newkirk	OK
Glenda	Phillips	Selah	WA
William	Slattery	Eugene	OR
Stan	Taylor	Eugene	OR
Audrey	Colombe	Tidewater	OR
Eric	Sol	Ashland	OR
Stephan	Wickham	Merlin	OR
Denise	Lytle	Fords	NJ
Dean	Thompson	Irving	TX
Anne	Gay	Ashland	OR
Rain	Rigge	Ashland	OR
Doug	Viner	Ashland	OR
Maximiliaan	Michels	Bourbonnais	IL
Bob	Morris	weaverile	CA
Jayne	Goodwin	Crescent	OR
Richard	Stickle	Ashland	OR
Dave	Maher	Ashland	OR
Elden	Parchim	Cave Junction	OR
Barbara	Eels	Gold Beach	OR
Natalie	Johnson	Arlington	VA
Alyssa	Walker	Portland	OR
Dan	Beausoleil	Williams	OR
Ann	Cobban	Redmond	OR
Rob	Harvey	Bend	OR
nicolette	ludolphi	GrÃ¶pelingen	AE
Andrea	Nemec	/	ot

Sara	Paoluzzi	Sacile	ot
Brenda	Amick	Talent	OR
Mary	Cody	Ashland	OR
Jason	Bowman	Placerville	CA
Candy	Bowman	Placerville	CA
donold	Burger	brookings	OR
Cassidy	Joy	Lake Oswego	OR
Allan	Miles	Ashland	OR
Donald	Smith	Cave Junction	OR
Cynthia	Edwards	Rogue River	OR
Anne	Mack	Mercer Island	WA
John	Riha	Ashland	OR
Matthew	Kaminker	Portland	OR
brad	niva	Merlin	OR
Beverly	Moore	Merlin	OR
JOAN	FLEMING	shelbyville	TN
Kathy	Dolan	Wheaton	IL
Amy	Elston	Glen Carbon	IL
Edith	Coleman	Wilmington	DE
Al	Abrams	Findlay	OH
Judy	Weaver-Mark	Grants Pass	OR
Lisa	Kelz	Cave Junction	OR
Patrick	wegner	albany	OR
Jean	Kaiwi	San Diego	CA
Susan Jane	Brown	Portland	OR
Richard	Chasm	Dillard	OR
Evelyn	Thompson	Ashland	OR
Carol	Hanrahan	Roseburg	OR
len	richardson	wolf creek	OR
Henry	Caswell	Phoenix	OR
Gordon	Longhurst	Grants Pass	OR
Debra	Cleland	Ashland	OR
Greg	Hatten	Eugene	OR
Sam	Drevo	Portland	OR
Joe	Hyer	Olympia	WA
Dave	Slover	Hood River	OR
Sandra	Wiese	Cheshire	OR
Laura	FArner	Salem	OR
Christine	Ashrow	Ashland	OR
Jeff	Jackson	Roseburg	OR
Chris	Ray	Parma	OH
Chantal	Buslot	Hasselt	ot
Yee Yean	Lim	Seri	ot
Beate	Michl	Munich	ot

Jill	Vickerman	Yzerfontein	ot
Lisa	Neste	High Point	NC
Danuta	Watola	Kalety	ot
Mike	Mahlstadt	Fort jones	CA
Lori	Kegler	San Pedro	CA
Rita	Kerkhofs	Antwerpen	ot
John	Livingston	Redding	CA
Henri	De Decker	Tisselt	ot
Gary	Hughes	Arcata	CA
Chavala	Bates	Grants Pass	OR
Megan	Fehrman	Jacksonville	OR
Andrew	Taylor	Ashland	OR
cristiano	pinnow	Lewisville	TX
Lynne	Matejcek	Ashland	OR
Kelly	Rucker	Lexington	SC
Kathy	Chadwell	Lafayette	IN
Victoria	Molinari	Poulsbo	WA
Dominic	Delarmente	Pasay	ot
Birgitta	Siponen	Oulu	ot
Annie	Wei	Queenslnad	NC
Yvonne	Fast	Aalborg	ot
Judy	Krach	Hazel Crest	IL
June	Cattell	West Columbia	SC
kx	bx	lanc	CA
Valerie	Hildebrand	Parma	OH
Alison	Baker	Swansea	IL
Dru Ann	Delgado	Munhall	PA
Larry	Tomlinson	Long Beach	CA
peter	faure	tarxien	CA
Elena	Belikova	Chicago	IL
nicole	silva	haverhill	MA
Cynthia	Gross	Ashland	OR
Stacey	Rohrbaugh	Willits	CA
Heather	Lewis	Phoenix	OR
Jerry	Sullivan	Mount Shasta	CA
Hugh	Lentz	Olympia	WA
Susan	Sinotte	Whitehorse	YT
Linda	Hughes	Portland	OR
Ana	Sonata	VI	ot
Gloria	Cameron	New Castle	PA
Nuno	Correia	Seixal	RI
Kenneth	Lapointe	Ottawa	ON
Agnes	Jean	Valreas	ot
Kathleen	Beavin	Bothell	WA

Jane	Mailloux	Portland	OR
Eve	Saglietto	Seeshaupt	ot
Debi	Mohan	Miami	FL
Ingrid	Cerqueni	Trieste	ot
Ewa	Piasecka	Warsaw	ot
Gillian	Miller	Bracknell	ot
Dennis	McNally	New Straitsville	OH
Lidia	Feliciano	ALAMEDA	CA
Candi	Ausman	Fremont	CA
Beverly	Gannon	london	CA
mary	rojeski	SANTA	CA
Barbara	blackburn	Portland	OR
Julien Kaven	Parcou	Victoria	ot
Gayla J.	Gatling	Waxahachie	TX
nancy	o	newark	DE
Toni	Adisano	Brooklyn	NY
Nancy	McIntyre	Regina	SK
amelie	laurent	la flotte	ot
f	mangels	mt shasta	CA
R	B	Escondido	CA
Bridgett	Cuffe	Ashland	OR
John	Holloway	Ashland	OR
Ted and Mary	Warrick	Grants Pass	OR
Chad	Derosier	Ashland	OR
Don	Walton	Ashland	OR
Eric	Kresh	Pittsburgh	PA
Amber	Shelton	Arcata	CA
Maria	sarris	Athens, Greece	ot
Martin	Hanley	dunsmuir	CA
Natalie	Johnson	Ashland	OR
Jeannine	Mihalek	Beavercreeek	OR
Andrea	Frank	Beach Park	IL
Debbie	Thomas	Fernley	NV
joyce	schwartz	altamonte	FL
Laura	Manges	Berea	KY
Bronwen	Evans	Vancouver	WA
Doug	Landau	St Petersburg	FL
Michael	MacIntyre	Laughlin	NV
Lorenz	Steininger	stafford	VA
Ricardo	Corrales	Heredia, Costa	CO
Kate	Kenner	Jamaica Plain	MA
Kimberly	Wiley	Rochester	NY
Gary	Gilardi	Hood River	OR
Kathleen	Wolfe	Des Moines	WA

Linda	Jones	CORNVILLE	ON
Cathy	Greer	Daytona Beach	FL
JOHN	PASQUA	Escondido San	CA
Maureen	ONeal	PORTLAND	OR
Serena	Wittkopp	Portland	OR
Alice	McGough	E Falmouth	MA
Mallika	Henry	Cambridge	NY
Gretchen	Hanger	New Hope	MN
Aleksander	Lindemann	Krsko	NY
John	Moszyk	St Louis	MO
Hal	Trufan	Matthews	NC
dan	cappello	lawrence	PA
Phyllis	Mollen	New york	NY
Julia	Jones	Grants Pass	OR
Shawn	Sorensen	Portland	OR
mauricio	carvajal	Santiago	ot
Tessa	Sibbet	Placerville	CA
Brian	Kwiatkowski	Cincinnati	OH
Linda	Hanson	The Dalles	OR
stefan	koch	baltimore	MD
Erik	Meldrum	Pleasant Hill	CA
Jim	Stout	Happy Valley	OR
Ellen	Gutfleisch	Sussex	WI
Anne	Settanni	Normal	IL
Lucy	Kelly	London	AR
Bennett	Pearson	Clinton	WA
Tim	Gibbins	Portland	OR
Angela	Wyble	Talent	OR
Paula	Musich	ashland	OR
Matthew	Messner	Ashland	OR
Ralph	Bowman	Central Point	OR
Lee	Calvert		
Randall	Smith	Omaha	NE
MARC	LEUTHOLD	PORTLAND	OR
M. E.	Braun	Corvallis	OR
Andrea	Scharf	Yachats	OR
Acacia	Lacy	Ashland	OR
Abraham	Karam	Tempe	AZ
kate	mount	grants pass	OR
Peggy	Rebol	Cottonwood	CA
Michele	Mercer	Casa Grande	AZ
mr	seldom	Gold Hill	OR
Brenda	Collins	London	NY
Sarah	Vaile	Ashland	OR

James	Feldmann	Corvallis	OR
Hailee	Nueva	Bend	OR
John	Woolley	Sequim	WA
Wolfgang	Rudolf		OR
Barbara	Holifield	Mill Valley	CA
Dennis	Pennell	Vancouver	WA
Jutta	Nowakowska	Torun	ot
Judyta	Dymkowska	Wroclaw	ot
Gary	Church	Aldershot. Qld.	ot
Brakha	Lav	Brooklyn	NY
Brenda	Towers	Durham	ot
Andrew	Seles	Ashland	OR
George	Sutherland	San Clemente	CA
Robert	Chandler	Eugene	OR
Whitney	Eure	Asheville	NC
Andrew	Mason	Talent	OR
Shane	Jimerfield	ASHLAND	OR
Jennifer	Harris	Hood RIver	OR
Alyssa	Hausman	Alexandria	VA
Stuart	Perillo	Fort Collins	CO
Dianne	Mackin	Grants Pass	OR
Denise	Brown	Merlin	OR
S. Colleen	Walch	Gold Hill	OR
RJ	Shapiro	Ashland	OR
carter	rose	Wolf Creek	OR
Steve	Ware	Merlin	OR
Peter	Newport		
Michael	Miles	Grants Pass	OR
Elizabeth	Hale		
Carol	Chan	Cave Junction	OR
john	rogers	Ashland	OR
Jon	Mellgren	Central Point	OR
Dianne	Reum	Grants Pass	OR
John & Janice	Limb	Ashland	OR
Steve	Chroningei	Merlin	OR
Drew	Irby	Mission Viejo	CA
Linda	Bellinson	Ashland	OR
Megan	Janssen	Ashland	OR
Jan	Janssen	Ashland	OR
stuart	o'neill	Ashland	OR
Suzanne	Grossmann	Ashland	OR
Anne	Koch	Portland	OR
Karen	Smith	Ashland	OR
Beverly	Bacak	Port Orford	OR

Patricia	Halleran	Ashland	CA
Kris	DeMaria	Portland	OR
Bob	Dingethal	Portland	OR
Niel	Lawrence	Olympia	WA
deb	buckley	Portland	OR
Erin	Jimenez	Central Point	OR
Jeff	Juel	Spokane	WA
Sheri	Jacob	Rogue River	OR
Shelley	Lotz	Ashland	OR
Ben	Wright	Eugene	OR
joseph	armstrong	o'brien	ore.
Lana	Obie	Bothell	WA
Barbara	McGarrah	Medford	OR
Edwin	Marvin	Cave Junction	OR
Jared	White	Corvallis	OR
Kathy	Gikkasoue	Grants pass	OR
Ben & Sally	Benjamin	Ashland	OR
Andrew	Linger	Avon	CO
Mary	Watson	Boise	ID
David	Ghelfi	Eugene	OR
robert	orcutt	Crescent	OK
Margy	Nickelson	Eagle Point	OR
Jennifer	Self	Seattle	WA
Octavia	Stradford	Bend	OR
Lori	Major	Holladay	UT
Jeff	Hunter	Chattanooga	TN
Peter	Grossmann	Ashland	OR
Lynda	Cue	Ashland	OR
Jacqueline	Green	Bandon	OR
Alex	Weber	Hillsboro	OR
Tara	Cottle	Ashland	OR
Laura	Franco	Eagle Point	OR
Daniel	Horton	milwaukie	OR
Jim	McMillen	Grants Pass	OR
Aaron	Theisen	Spokane	WA
Cecilia	Watson	Central Point	OR
Lori	Levine	Grants Pass	OR
Sam	Gressett	Portland	OR
David	Trageser	Portland	OR
Harlan	Walker-Young	Jacksonville	OR
Tim	Brink	Sandy	OR
Sarah	Miller	vancouver	WA
Cameron	La Follette	Salem	OR
Allen	Sayble	Ashland	OR

HP	Lovell	Grants Pass	OR
Paul	Kuthe	Portland	OR
Scott	Edwards	SWARTHMORE	PA
jessamyn	johns	portland	OR
George	Neste	High Point	NC
Dejah	Leger	Shoreline	WA
Jane	Van Dyke	Ashland	OR
David	Johnson	Sedro-Woolley	WA
paul	goff	o'brien	OR
Greg	Davenport	Ridgefield	WA
Jerry	Williams	Spokane	WA
gary	brensdal	Beaverton	OR
Jay	Humphrey	Estacada	OR
Christy	Ivory	Ashland	OR
Hanne	Hoppe	Central Point	OR
Gordon	Lyford	O'Brien	OR
Mary	Yount	Ashland	OR
Lyla	Emery	Portland	OR
Scott	Dunn	Oregon City	OR
Barbara	Ullian	Grants Pass	OR
Carmon	Thomas	Philomath	OR
Elena	DeLisle	Shoreline	WA
Sheena	Keavney	Portland	OR
Sheryl	Gerety	Davis	CA
Russ	Thomas	Creswell	OR
Sam	Reese	Portland	OR
cathy	hughes	kerby,	OR
Jordan	Lanz	Portland	OR
Scott	Baker	portland	OR
Charlotte	Peterson	Central Point	OR
Cari	Eisler	Portland	OR
Fran	Eastman	Ashland	OR
Kevin	Janssen	Portland	OR
Ryan	Turner	Grangeville	ID
Gail	Pearlman	Grants Pass	OR
Beth	Anderson	Medford	OR
Amy	Johnson	Delaware	OH
John	Loehrer	Gresham	OR
Dr Nancy D	Bonazzoli	Grants Pass	OR
Cici	Brown	Ashland	OR
shannon	Cornish	Medford	OR
Earl	Peterson	Central Point	OR
Nancy	Fleischman	Applegate	OR
James	Keskimaki	Eugene	OR

CATHY	FREEMAN	ASHLAND	OR
matt	moreland	sandy	OR
Eileen	Amaranthus	Grants Pass	OR
Peter	Gibb	ashland	OR
Carrie	Robertson	Jacksonville	OR
Ira	Munkvold	Portland	OR
Courtney	Neron	Portland	OR
Carol	Putnam	Central Point	OR
Clayton	Gillette	Medford	OR
robert	scott	Ashland	OR
Sandy	Tracy	Medford	OR
Frederick	Gant	Ashland	OR
jo	wayles	Ashland	OR
Michelle	Lamoreaux	rhododendron	OR
Rebecca	Pierce	Astoria	OR
David	Frank	Gold Hill	OR
Linda	Ford	Grants Pass	OR
Allen	Gillette	Albany	OR
John	Johnson	Hixson	TN
Duane	Short	Tempe	WY
Dustin	briedwell	Portland	OR
Robb	Keller	Vancouver	WA
Catherine	Dennerlein	Grants Pass	OR
david	darby	ashland	OR
Robert	Janssen	ASHLAND	OR
David	Lorenzen	Grants Pass	OR
ursula	robichaud	medford	OR
Paul	Christensen	Ashland	OR
Ken	Barker	Tigard	OR
Geoffrey	Becker	Applegate	OR
Jeffrey	White	Forest Grove	OR
Brienne	Blacklidge	Oregon City	OR
Leland	Hanson	Portland	OR
Ryan	Slagle	Portland	OR
Kim	Ingvaldson	Grants Pass	OR
Margaret	Cochrane	Medford	OR
Cheryl	Ford	Happy Valley	OR
Carol	McCutcheon	Medfor	OR
ron	kay	oceanside	CA
gloria	stone	Ashland	OR
Gabe	Strand	Seattle	WA
Peter	Gandesbery	Ashland	OR
martha	marvin	Junction City	OR
Kris	Schmidt	medford	OR

patricia	hume	ashland	OR
Reese	Haydon	Grants Pass	OR
DEANNA	GOSSNER	Medford	OR
Lisa	Waters	Arcata	CA
Richard and	Streng	ashland	OR
lloyd	knapp	ashland	OR
Lynn	Funk	Williams.Or.	OR
Patricia	Barry	Portland	OR
Kelly	Green	Cave Junction	OR
Ann	Cuddy	Ashland	OR
Michael	Cerbone	Portland	OR
cody	hiestand	portland	OR
Emmet	Band	Eugene	OR
michael	fitzgerald	Ashland	OR
Jacqueline	Taylor	Medford	OR
JAMES	DRAEGER	Portland	OR
Frances	Adams	Ashland	OR
Annette	Drager97535	Phoenix	OR
Charles	Hall	Eugene	OR
Michele	Brown-Riding	Grants Pass	OR
Christine	Gardener	Cave Junction	OR
Gloria	Schwartz	Ashland	OR
Timothy	Stetz	Cave Junction	OR
Patricia	McFadden-	Ashland	OR
Jeremy	Blau	Jacksonville	OR
Jim	Massey ND	Potland	OR
linda	kappen	Applegate	OR
chris	pin	talent	OR
Dyan	Larson	Rockford	IL
Lorna	Pearman	Dexter	OR
Jenna	Patterson	Lynnwood	WA
Renate	hOGAN	Medford	OR
Kathleen	Byrne	Phoenix	OR
M	Smith	Salem	OR
Jadwiga	Reinke	Redding	CA
Jesse	Wakeley	Eugene	OR
Benton	Elliott	Eugene	OR
Susan	Herzog	Eugene	OR
kieran	walsh	Eugene	OR
Tobias	Policha	Eugene	OR
Amy	Atwood	Portland	OR
Barbara	Hetland	Ashland	OR
Charmaine	Rehg	Eugene	OR
Barb	Shamet	Allegany	OR

Toby	Kubler	EUGENE	OR
Loretta	Huston	Cottage Grove	OR
Dana	Furgerson	Eugene	OR
Steve	Barnes	Cottage Grove	OR
Firelin	Jones	Eugene	OR
Peter	Jensen	Benson	VT
Alice	Pace	Cave Junction	OR
Barbara	Tada	Cottage Grove	OR
Kathleen	Kliewer	Grants Pass	OR
EDMUND	GLOVINSKY	Grants Pass	OR
Sara	Burant	Eugene	OR
Noah	Marquis	Sherwood	OR
Rebecca	Jamieson	Portland	OR
david	monk	Eugene	OR
tenaya	gilman	myrtle creek	OR
Alice	Stroud	Eugene	OR
Maretta	Stiles	Pasadena	CA
Lisa	Byers	Merlin	OR
joanne	costantino	Ashland	OR
Mary M.	Grant	Springfield	OR
James	Lanz	Vancouver	WA
Catherine	Boucher	Eugene	OR
Kathrin	Strieby	Hillsboro	OR
Tresa	Beaver	Eugene	OR
Lori	Carty	Monterey Park	CA
Alex	Lanz	Vancouver	WA
Miles	Uchida	Portland	OR
Jennifer	Gerrard	Eugene	OR
Marilyn	Wilbur	Central Point	OR
H. M.	Sustaita	Eugene	OR
Nancy	Mendenhall	Medford	OR
Louise	Shawkat	Ashland	OR
Barbara	Braunstein	Selma	OR
Willa	Gustavson	Cave Juntion	OR
Susanne	Krieg	Ashland	OR
Jessica	Elledge	Springfield	OR
Marianne	Jessop	Ashland	OR
Maria	Holloway	Medford	OR
Richard	Skidmore	Gainesville	FL
Mary	Gabriele	Cottage Grove	OR
Jennifer	Davis	Ashland	OR
Emily	Minah	Talent	OR
Pauline	Grant	Manchester	NH
Ben	Clark	Portland	OR

W Bruce	Wright	Ashland	OR
corine	cathala	Pierrelatte	ot
Jarrod	Kaplan	Eugene	OR
Riley	Morgan	McMinnville	OR
Matthew	Estes	Springfield	OR
Kathleen	Cortapassi	Grants Pass	OR
Grant	Whipp	Redding	CA
Albert	Honican	Winter Haven	FL
Jonathan	Huhn	Lawrenceville	GA
Jennifer	Natali	Berkeley	CA
Scott	Coryell	Lees Summit	MO
Patrick	Wilson	Grants Pass	OR
Henry	DeGuc Jr.	Grants Pass	OR
Tami	Workinger	Grants Pass	OR
D.	Smith	Grants Pass	OR
Amy	More	Williams	OR
Merry	Schmidt	Grants Pass	OR
Brittany	Hayes	Rogue River	OR
Robin	Elliott	Grants Pass	OR
Meghan	Bost		
Rob	Locher	Merlin	OR
Teresa	Wicks	Ashland	OR
Julie	Bacon	Eugene	OR
Mark	Jordan	Eugene	OR
Snake	Harrington	Springfield	OR
Jens	Odegaard	Corvallis	OR
Erica	Champagne	victoria	BC
pjpfwozfb	pjpfwozfb	WzvpZqmnUeS	GA
Jasmina	Cuk	Solna	NY
Audrey	Shapiro	Medford	OR
Sean	Corrigan	Trinity Beach	CA
Ellen	Goodman	Riverside	RI
nokomis	callender	coos bay	OR
Rebecca	Lorang	Williams	OR
amy	schumacher	beavercreek	OH
Setsuko	Maruki-fox	Grants Pass	OR
Casey	Schnaible	Medford	OR
Chad	Hymel	Los Angeles	CA
Diana	Dorsett	Fort Worth	TX
Ramona	Bennett	Grants Pass	OR
Andrew	Brown	Portland	OR
David	Blain	BEND	OR
Melinda	Wright	Covington	GA
kevin	sewell	nottingham	NY

Sylwia	Dawidek	Cracow	ot
Ulrike	MacKay	Wilhelmsthal	ot
CINDY	ZIMMERMANN	IMPERIAL	CA
christelle	coudyser	pÃ©gomas	ot
Pete	Wallstrom	Ashland	OR
David	Modarelli	Akron	OH
cat	koehn	fall creek	OR
Cary	Thompson	Eugene	OR
michela	messineo	Roma ITALY	ot
Will	Sears	Talent	OR
Tracy	Harding	Ashland	OR
Roger	Funk	Talent	OR
Dave	Lacey	Gold Beach	OR
Evelyn	Roether	Williams	OR
Konrad	Klamath	Somes Bar	CA
Wendy	Forster	Manchester	ot
Lesley	Adams	Talent	OR
Marcia	Denison	Rainier	OR
peggy	peters	champions	FL
Donna	Dove	Ashland	OR
Arden	Prehn	Talent	OR
Shanti	Shunn	Medford	OR
Jon	Carlson	Ashland	OR
Mark	Takaro	Berkeley	CA
Dagmar	Grabsch	Berlin	FL
Will	Volpert	Ashland	OR
Hester	Goedhart	Dayboro	ot
Carol	Ampel	Medford	OR
Kenneth	Stern	Cave Junction	OR
John and Polly	Wood	Hood River	OR
Dakota	Otto	Ashland	OR
Heidi & Jim	Parker-Shames	Ashland	OR
Marian	Crumme	Ashland	OR
David & Leann	Tourzan	Ashland	OR
Jason	Reynolds	Portland	OR
Bert	Fox	Portland	OR
Donna	Swanson	Ashland	OR
Karen	Horn	Ashland	OR
Dave	Maize	Cave Junctioin	OR
Randy	Weaver	Eureka	CA
Erin	Moore	Bellingham	WA
Jeffrey	Thompson	Medford	OR
Arlene	Aron	Jacksonville	OR
William	Ward	Eugene	OR

Laurel	Merchant	ashland	OR
Brenda	Schweitzer	Talent	OR
Tyler	Kappen	Ashland	OR
Ayani	Mikasi	Talent	OR
deborah	delaunay	Ashland	OR
Beth	Nolan	Ashland	OR
Mary	Ehlers	ASHLAND	OR
Bob	Thomas	Myrtle Creek	OR
Laura	Guerrero	Grants Pass	OR
Statia	Ryder	Port Orford	OR
Zac	Kauffman	Phoenix	OR
John	Bowden	Springfield	OR
Kay	Fontaine	Grants Pass	OR
David	Tourzan	Ashland	OR
Koeby	Johnson	Ashland	OR
Christine	Yee	Gold Hill	OR
James and	Diefenderfer	Cave Junction	OR
Rachel	Goodman	Cave Junction	OR
janet	huntamer	O Brien	OR
Glenn	Cross	Williams	OR
Paul	Howard	Corvallis	OR
Nina	Horsley	CJ	OR
Brent	Jensen	Hillsboro	OR
Tyler	Flaming	Grants pass	OR
Gage & Tyler	Flaming	Grants pass	OR
Robert	Barker	Shady Cove	OR
Robert	Mumby	Phoeix	OR
Marcia	Rodine	Ashland	OR
Pat	Bath	Grants Pass	OR
Emmalyn	Garrett	Grants Pass	OR
Mary	Conroy	Selma	OR
Heidi	Dawn	Ashland	OR
Hal	Anthony	Grants Pass	OR
Kari	Rein	Williams	OR
Harold	Christiansen	Lincoln City	OR
Patricia	Vazquez	Mexico City	ot
Susan	Orris	Merlin	OR
David	Councilman	Saint Louis	MN
William	Gates	Ashland	OR
Beth	Levin	Ashland	OR
Lee	Gelatt	Grand Junction	CO
Michael	Dean	North Bend	OR
Raja	Anderson	S.F.	CA
Michelle	Waters	Los Gatos	CA

desanka	sandulovic	belgrade	ot
Dennis	Kasunic	Portland	OR
Susie schmidt	schmidtsusie@hotmail.com		
Kim Pearson	kim_pearson_mk@hotmail.com		
Whitney Lowery	whitneynlowery@gmail.com		
Flora Krivak-Tetle	ultraflora@gmail.com		
Kathy Tonegawa	kathytonegawa@gmail.com		
Krista Vegter	Kristapista@hotmail.com		
jenn shelton	jennjennjennjennjennjenn@gmail.com		
Justin Dack	justin.dack@gmail.com		
Iain Donnelly	iaindonnelly1@hotmail.com		
Tim Zander	tzndr@yahoo.com		
Jillian Everly	Jeverly4@gmail.com		
Adam Marshall	Marshall.ac@gmail.com		
Cynthia Schultz	broad@eastlink.ca		
SHAHID ALI	shahidnali@gmail.com		
Tyler Coxen	Tcoxen89@gmail.com		
Ryan Ghelfi	Ghelfir@gmail.com		
Steven VanArsda	stevenvanarsdale1@gmail.com		
Paul Lowes	1paullowes@gmail.com		
Cole Berg	vonshredman@gmail.com		
Jennifer Dalton	jenniferjdalton@gmail.com		
Wendy Fielder	Louiewendell@msn.com		
Emily Loose	eloose8@gmail.com		
Scott Mirabello	Scott@instigateur.com		
Rick Perry	rick@beetboost.com		
Charlotte Nolan	charlottepenman@gmail.com		
Rachael Ze	rachaeln.be@gmai.com		
Maggie Vacherwe	mevw99@gmail.com		
Natalie Chirgwin	natchirgwin@gmail.com		
Dean Silver	dean@silvagio.com		

The Economic Value of Rogue River Salmon

Commissioned by the
Save the Wild Rogue Campaign,
with funding support from the Giles
& Elise Mead Foundation

January 2009

ECONorthwest
ECONOMICS • FINANCE • PLANNING

Prepared by: Ted L. Helvoigt, Ph.D.
Diane Charlton

Date submitted January 30, 2009

ECONorthwest
ECONOMICS • FINANCE • PLANNING
99 W. Tenth, Suite 400
Eugene, OR 97401
(541) 687-0051

The Economic Value of Rogue River Salmon

EXECUTIVE SUMMARY

In 2008, the ***Save the Wild Rogue Campaign*** engaged ECONorthwest to analyze the economic value of salmon and steelhead in the Wild & Scenic Rogue River. In this report, we summarize the results of our analysis, which is based on peer-reviewed, published research, results from the Oregon Population survey, and fish-count data published by the Oregon Department Fish and Wildlife.

- Salmon are the quintessential icon of the Pacific Northwest with significant cultural and economic value. Based on the results of more than ten years of household surveys, Oregonians overwhelmingly and consistently state that protecting and enhancing salmon habitat is important.

- West coast residents alone enjoy more than $1.5 billion in economic benefit each year from the entirety of all Rogue River salmon and steelhead runs. Maintaining the current level of protection on the Rogue may not be sufficient to ensure that current and future residents will be able to enjoy this level of economic benefit.

- In this analysis, we develop estimates for only three of the economic values associate with Rogue River salmon: commercial fishing, sport fishing, and non-use value. Non-use values represent the vast majority of the economic value of Rogue River salmon.

  - $1.4 million annually associated with commercial fishing
  - $16 million annually associated with sport fishing
  - $1.5 billion annually associated with non-use values

- For more than a decade, Oregonians have consistently stated that improving salmon habitat is important and have expressed a willingness to pay more than $70 million dollars per year to enhance salmon habitat in Oregon.

- Oregon and Washington residents state a willingness to pay more than $800 per fish to increase Northwest salmon populations

- The Wild & Scenic Rogue River is a national treasure. Each year, tens of thousands of rafters, anglers, hikers, and other sightseers visit the river, and recreate in or along it. Its cultural importance to many Americans is comparable to our most majestic National Parks and National Monuments.

- Healthy salmon habitat is a necessary condition underlying the Wild & Scenic Rogue River's rich ecological abundance as well as the values derived from it. Today, while many salmon runs in the Northwest are either endangered or threatened, the majority of the Rogue's salmon runs remain relatively strong. Over the past decade, salmon and steelhead counts at Gold Ray Dam average nearly 87,000 fish annually. As residential and commercial development continues to degrade Northwest rivers, it becomes increasingly important to protect the scarce, healthy rivers such as the Wild & Scenic Rogue and its tributaries.

- As global warming threatens to bring drastic weather changes to the Rogue Valley, the importance of streams flowing into the Rogue will only increase. They provide critical spawning grounds and cold water refugia for salmon and steelhead. Increasing protection for these streams may serve to offset some of the adverse impacts on the Rogue River anticipated as the region experiences changes in climate in the coming years. The cold water provided by these streams will help mitigate increasingly warm summer water temperatures in the Rogue.

Enhanced protection of the critical streams that flow into the Wild & Scenic Rogue River is a virtually costless action that will lead to significant economic benefits for both the present and future generations. In light of the economic downturn currently facing the nation, the need for both immediate and long-term economic payoffs has never been greater. Investments in the protection of salmon habitat in the Wild & Scenic Rogue will continue to provide economic benefits to society for many generations. The results presented in this report demonstrate that Rogue River salmon and steelhead provide large net benefits to society. Policy-makers should take steps now to protect the Wild & Scenic Rogue River habitat so that society may begin reaping the benefits of these actions today.

INTRODUCTION

The Save the Wild Rogue Campaign engaged ECONorthwest[1] to analyze the economic value of salmon and steelhead in the Wild & Scenic Rogue River. In assessing this value, ECONorthwest considered the benefits of salmon to the commercial fishing industry, to sport anglers, and for their intrinsic value to residents of Oregon and the West Coast. It is important to recognize the limitations of this analysis. Salmon have significant cultural value to Northwest Tribes, they provide benefits to the entire ecosystem of the Rogue Valley, and they are a valuable source of food for marine mammals. ECONorthwest did not attempt to evaluate the economic value of these important cultural and biological benefits. Thus, the values in this report should be viewed as lower bound estimates of the true economic value of salmon.

The Rogue River is extraordinary, both as a river and as salmon and steelhead habitat. Located in the southwestern corner of Oregon, the Rogue River flows approximately 215 miles from its headwaters in the Cascade Range, near Crater Lake, reaching the Pacific Ocean at the city of Gold Beach. In 1968 Congress designated an 84-mile stretch of the Rogue River from the confluence of the Applegate River (seven miles downstream of the City of Grants Pass) to the Lobster Creek Bridge (11 miles upstream of Gold Beach) as a National Wild and Scenic River. The Rogue River was one of the original eight rivers included in the Wild and Scenic Act, which protects from development or degradation certain rivers or river segments that have national significance.

The Wild and Scenic section of the Rogue River provides important habitat for a variety of wildlife including spring and fall Chinook, summer and winter steelhead, and coho salmon. This section of the river and its tributaries serve both as spawning grounds for certain anadromous fish and as an important migratory path for other anadromous species as they travel upstream to spawn or from spawning grounds to the ocean. The water quality in this section of the river and its tributaries affects the health of salmon and steelhead. Normal fish growth and productivity increases depend on cold stream temperatures, which helps regulate salmonid metabolic function. As stream temperatures rise, abnormal fish behaviors and mortality increase[2].

According to the National Marine Fisheries Service, the survival of Pacific Northwest salmon and steelhead—and the commercial harvests they support—depend on protecting and restoring habitat diversity and migratory

[1] Throughout this report, the terms "we," "our" and "us" refer to the authors of this report at ECONorthwest.

[2] Heyn, K. 2008. *White Paper on the Biological Contributions of Tributary Streams to the Wild Rogue River, Oregon.* American Rivers.

connections among habitats[3]. The Rogue River is the spawning, rearing, and migration site for nearly 100,000 anadromous fish returning from the ocean each year. Only the Columbia River produces more Pacific Salmon in the state of Oregon[4]. As salmon populations in other rivers in the Pacific Northwest decline, healthy habitats such as the Rogue River become even more important and valuable.

Conserving healthy salmon populations also reinforces recreational, aesthetic, and other economically significant amenities in the Pacific Northwest. Workers benefit from healthy salmon habitats by living amid high-quality natural-resources amenities. In effect, workers receive a second paycheck—denominated in access to scenic vistas, outdoor recreation opportunities, etc.—that augments the first paycheck earned through work and investments. In fact, evidence suggests that the second paycheck is great enough to offset the potential benefits that would accrue from attracting more businesses to the region through environmental deregulation. In a 1993 survey, the Oregon Business Council asked Oregonians, "Which is more important to economic growth in Oregon? Relax environmental regulations to make it easier for companies to do business or maintain a quality environment to attract people and companies to Oregon?" Of the 90 percent of the respondents who had an opinion, over four times as many wanted Oregon to "maintain a quality environment" than to "relax environmental quality[5].

High environmental quality standards do not indicate that businesses have fewer incentives to locate in the Pacific Northwest region. The quality of life in the Pacific Northwest, characterized largely by its natural resources, also attracts new residents who often have higher levels of education than current residents and they often are willing to accept reduced earnings to live in the Pacific Northwest[6]. Attracting high-quality workers at lower costs relative to other regions of the country, helps businesses in the Pacific Northwest compete with firms elsewhere, thus strengthening this region's economy.

Studies of federal lands in the Pacific Northwest found that, on a per-acre basis, the economic value of fishing exceeds the values of all other recreational activities[7]. Protecting salmon habitats helps improve the quality

---

[3] NOAA's National Marine Fisheries Service. 2006. *Salmon Habitat*. Retrieved December 1, 2008, from http://www.nwr.noaa.gov/Salmon-Habitat/index.cfm.

[4] Heyn, K. 2008. *White Paper on the Biological Contributions of Tributary Streams to the Wild Rogue River, Oregon*. American Rivers.

[5] Oregon Business Council. 1993. *Oregon Values and Beliefs: Summary*. May.

[6] Judson, D.H., S. Reynolds-Scanion, and C.L. Popoff. 1999. "Migrants to Oregon in the 1990's: Working Age, Near-Retirees, and Retirees Make Different Destination Choices." *Rural Development Perspectives* 14 (2): 24-31.

[7] Forest Ecosystem Management Assessment Team. 1993. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Land Management, and Environmental Protection Agency. 794-478. July.

of other recreational activities, such as fishing and boating, which enhance the economic value of the region's natural resources.

SALMON AND THE ENDANGERED SPECIES ACT

Twenty-nine species of West Coast salmon and steelhead are listed as either endangered or threatened under the Endangered Species Act (ESA) and two species are listed as a species of concern[8]. Table 1 summarizes the 2008 ESA listings for West Coast salmon and steelhead. Coho salmon, which use the Wild & Scenic section of the Rogue River as a migratory path to spawning grounds on the Upper Rogue River, are a threatened species. Coho salmon occupy approximately fifty percent of their historic range and scientists are concerned about further population loss in larger river basins such as the Rogue, Klamath, and Trinity Rivers[9].

Overfishing used to be the major cause of salmon decline, but in recent years, loss of freshwater habitat has become the largest threat to salmon populations. Habitat degradation occurs through mining, logging, cattle grazing and agricultural practices, and blockage of river systems by dams for electricity generation, flood control, and irrigation[10].

NOAA's National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service share responsibility for the listing of species under the Endangered Species Act.[11] NMFS manages marine and anadromous species, including all species of west coast salmon and steelhead. Economic factors are not to be considered by NMFS when determining if a species is sufficiently at risk of extinction that it warrants listing as a threatened or an endangered species under the provisions of the ESA. The agency also is not to consider economic issues when it determines whether or not to provide legal protection to a listed species. Instead, these determinations are to be based solely on biological factors. Economics comes into play only when, for each listed salmon species, the Secretary of Commerce designates critical habitat, an action that restricts federal agencies from taking actions that would destroy or adversely modify habitat essential to conserving the species. Before making this determination, the Secretary must consider all the economic impacts, plus national-security and other impacts. Following this accounting, the Secretary may exclude an individual area from the designation only if the benefits of exclusion for that area outweigh the benefits of designation.

---

[8] NOAA's National Marine Fisheries Service. 2008. *Snapshot of Salmon & Steelhead ESA Status.* http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm.

[9] NOAA's National Marine Fisheries Service Southwest Regional Office. *Southern Oregon/Northern California Coast Coho ESU.* Retrieved Nov. 20, 2008 from, http://swr.nmfs.noaa.gov/recovery/Coho_SONCCC.htm.

[10] Montgomery, C.A. and T.L. Helvoigt. 2008. *Trends in Oregonians' Willingness to Pay for Salmon.*

[11] NOAA is the National Oceanic and Atmospheric Administration.

Table 1: Endangered Species Act Status of West Coast Salmon & Steelhead

	Species	Endangered Species Act Listing Status	ESA Listing Actions Under Review
Sockeye Salmon (Oncorhynchus nerka)	Snake River	Endangered	
	Ozette Lake	Threatened	
Chinook Salmon (O. tshawytscha)	Sacramento River Winter-run	Endangered	
	Upper Columbia River Spring-run	Endangered	
	Snake River Spring/Summer-run	Threatened	
	Snake River Fall-run	Threatened	
	Puget Sound	Threatened	
	Lower Columbia River	Threatened	
	Upper Willamette River	Threatened	
	Central Valley Spring-run	Threatened	
	California Coastal	Threatened	
	Central Valley Fall and Late Fall-run	Species of Concern	
Coho Salmon (O. kisutch)	Central California Coast	Endangered	
	Southern OR/Northern CA	Threatened	
	Lower Columbia River	Threatened	Critical Habitat
	Oregon Coast	Threatened	
	Puget Sound/Strait of Georgia	Species of Concern	
Chum Salmon (O. keta)	Hood Canal Summer-run	Threatened	
	Columbia River	Threatened	
Steelhead (O. mykiss)	Southern California	Endangered	
	Upper Columbia River	Endangered	
	Central California Coast	Threatened	
	South Central California Coast	Threatened	
	Snake River Basin	Threatened	
	Lower Columbia River	Threatened	
	California Central Valley	Threatened	
	Upper Willamette River	Threatened	
	Middle Columbia River	Threatened	
	Northern California	Threatened	
	Puget Sound	Threatened	Critical Habitat
	Oregon Coast	Species of Concern	

Source: ECONorthwest with data from NOAA's National Marine Fisheries Service. 2008. *Snapshot of Salmon & Steelhead ESA Status*. http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm.

Many benefits accrue from designating critical salmon habitat, which could also be realized through improved ecosystem management practices in areas *not* designated as critical habitat. Improving water quality and aquatic habitat creates many benefits that are not directly related to salmon. In fact, many businesses and farms reduce their impacts on streams because they

find it profitable to do so[12]. Benefits may be realized through reductions in flood damages, improvements in bird habitat, water quality, recreational opportunities, and increased property values near the stream. The area and extent of the impacts of the improved habitat can be vast. Benefits may be seen downstream from the site or in other watersheds. It is not necessary to wait for a stream or watershed to be designated as a critical habitat to obtain these benefits. The costs of improving water quality and aquatic habitat are often less than the benefits gained by doing so and when the risk of salmon extinction depends on the given habitat the benefits are even greater.

However, once the ESA designates critical habitat, more costs will be imposed on the residents, businesses, and local governments impacted by the habitat area. The laws pertaining to critical habitat impose several costs on federal agencies and private parties with an interest in the critical habitat region. The consultation costs of obtaining an assessment from the federal government of a project's impact on the species' habitat, the costs of modifying a given project to comply with ESA, and the costs of delaying the implementation of the project while assessments and modifications are made are a few of the costs associated with critical habitat[13]. Many of these costs can be avoided by improving salmon habitats before critical habitat is designated.

ANADROMOUS FISH ON THE ROGUE RIVER

Table 2 shows the fish counts for different species of anadromous fish at Gold Ray Dam for years 1997 through 2006. Gold Ray Dam is located approximately thirty river miles upstream of the start of the Wild & Scenic Section of the Rogue River so the numbers reported represent only the fish that pass through the Wild & Scenic Section to spawn above the dam. Table 3 shows the estimated fish escapements for different species at Huntley Park located downriver from the Wild & Scenic Section. Based on conversations with the Oregon Department of Fish and Wildlife there are no known data of the number of anadromous fish that spawn and rear in the Wild & Scenic Rogue River and its tributary streams.

---

[12] Goodstein, E., B. Doppelt, and K. Sable. 2000. *Saving Salmon, Saving Money: Innovative Business Leadership in the Pacific Northwest*. Center for Watershed and Community Health, Portland State University; Sullivan, P., D. Hellerstein, L. Hansen et al. 2002. *The Conservation Reserve Program: The Implications for Rural America. United States Department of Agriculture, Economic Research Service*. Agriculture, Economic Report 834. September.

[13] Sunding, D. *The Economic Impacts of Critical Habitat Designation*. Giannini Foundation of Agricultural Economics.

Table 2: Fish Counts at Gold Ray Dam

Year	Summer Steelhead	Winter Steelhead	Spring Chinook	Fall Chinook	Coho	Total Steelhead, Chinook, and Coho
1997	7,538	14,957	41,794	4,857	15,750	84,896
1998	6,056	5,029	15,957	5,332	6,044	38,418
1999	4,785	9,497	20,981	3,540	7,722	46,525
2000	6,734	6,807	30,265	9,892	28,791	82,489
2001	16,114	8,944	33,273	13,606	32,962	104,899
2002	29,296	22,287	47,781	19,823	34,154	153,341
2003	20,297	24,850	41,841	24,857	17,179	129,024
2004	13,658	21,889	39,243	15,007	21,702	111,499
2005	10,414	11,908	18,090	8,615	14,632	63,659
2006	14,579	9,560	11,718	6,908	11,368	54,133

Source: ECONorthwest with data from Oregon Department of Fish and Wildlife, Roseburg. 2003. Letter to Ted Helvoigt. and Oregon Department of Fish and Wildlife, Fish Division. 2008. *Fish Counts*. Retrieved October 29, 2008, from http://www.dfw.state.or.us/fish/fish_counts/goldray/2006/gold_ray_dam._2006.asp.

Figure 1: Fish Counts at Gold Ray Dam (1943-2006)

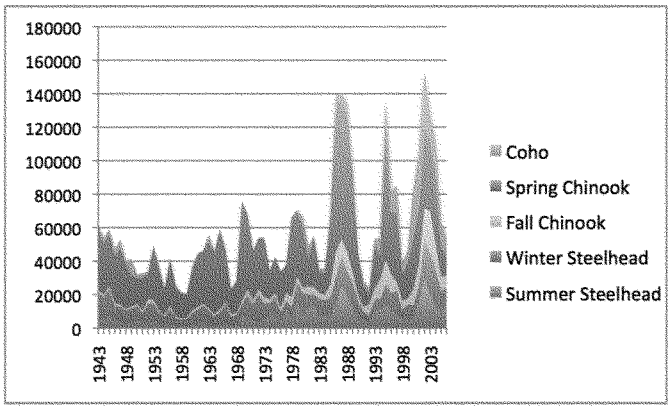


Table 3: Huntley Park Estimated Adult Fish Escapements

Year	Summer Steelhead	Fall Chinook	Coho
1997	15,325	17,186	40,647
1998	9,222	16,867	6,817
1999	15,882	19,456	6,155
2000	21,856	34,562	18,572
2001	17,397	35,447	37,243
2002	35,813	62,576	27,103
2003	21,005	86,551	16,071
2004	14,209	55,170	46,546
2005	10,466	23,733	8,271
2006	18,142	14,738	16,397

Source: ECONorthwest with data from Mazur, Steven. 2008. *Huntley Park Trend Data*. Email to T. Helvoigt October 22.

The Wild & Scenic section of the Rogue River and its tributaries provide important cold water refugia for salmon and steelhead. Anadromous fish are present in at least 100 stream miles across 14 tributary streams of the Rogue River[14]. The streams play an important role in salmon habitat as they bring colder water temperatures to the larger main Rogue, and they provide refuge from the warm water temperatures of the main stem during summer months. These cold temperatures also permit higher concentrations of oxygen to dissolve in the water. With the projected climate changes predicted for the coming years, these cold water streams will become even more valuable to salmon and steelhead survival. A report which utilized aerial thermal surveys indicated that there already is a trend of downstream warming on the Rogue. The cold water refugia is necessary for migrating salmon and steelhead so that they remain healthy and able to fight disease. Each species of anadromous fish uses the Rogue River habitat in a different manner, but the health of the river and its streams is important to the health of each species.

For instance, coho salmon use the Wild & Scenic Section of the Rogue River as a migratory path. Coho can mostly be found in Lobster, Quosatana, Silver, Foster, Shasta Costa, Lawson, Mule and Billings Creeks, which feed into the Rogue River. In the summer, coho prefer to swim to pools in small streams. In the winter, they prefer off-channel alcoves. Complexity, such as mixtures of small and large wood, is important for productive coho streams. The health of the Rogue River, as a migratory passage, and its tributaries, as spawning and rearing grounds, are key factors for the health of coho salmon.

Wild spring Chinook also use the main stem of the Rogue River as a migratory passage and spawn above Gold Ray Dam. Fall Chinook usually spawn in the lower regions of the river. Only about 10% of fall Chinook spawn above Gold Ray Dam. The early entry adults spawn between Grave Creek and Gold Ray Dam and in the lower 25 miles of the Applegate River.

[14] Heyn, K. 2008. *Save the Wild Rogue*. American Rivers.

The late entry adults typically spawn below Watson Creek on the Rogue River and in the Illinois basin. The Wild & Scenic section of the Rogue River is an important spawning ground for the fall Chinook. In 1979, pre-spawn mortalities of fall Chinook from low flows and high temperatures on the Rogue River were as high as 85%. Although there is not enough data available to draw any conclusions about the health of late entry fall Chinook, it appears that their population is declining. Table 4 shows the redd (salmon nest) counts on the main stem of the lower Rogue River from surveys conducted by the Oregon Fish and Wildlife Department every twenty years.

Table 4: Redd Counts on the Lower Rogue River

Survey Year	Method	Redds/mile
1953	Boat	5.1
1954	Boat	5.7
1974	Plane	4.0
1976	Plane	4.3
1993	Helicopter	0.2

Source: Weinhold, M. Lower Rogue River Basin Watershed Condition Assessment. 1995. Lower Rogue Watershed Council for State of Oregon Watershed Health Program and Strategic Water Management Group.

Winter steelhead also spawn in the Wild & Scenic section. They most often spawn in the tributary streams to the Rogue, only spawning in the main stem if objects obstruct their passage or when water levels are too low to permit them to spawn in the smaller streams. Summer Steelhead usually spawn above the Wild & Scenic Section but half-pounders usually overwinter within the lower fifty miles of the Rogue's main stem and over 95% of the summer steelhead have a half-pounder lifestyle.

The health of the Wild & Scenic Rogue River as a salmon spawning, rearing, and migratory habitat is necessary for the protection of healthy anadromous fish. Maintaining cold water temperatures in the main stream of the Rogue River with limited debris and protected watersheds will help to maintain a healthy habitat for salmon and steelhead.

VALUE OF ROGUE RIVER SALMON

By protecting salmon and steelhead populations in the Rogue River, Oregon is protecting an asset important to residents of the Pacific Northwest. For example, studies indicate that households in Washington and Oregon are willing to pay $30-$130 per year to finance salmon recovery efforts[15]. Salmon populations also help sustain jobs in the Pacific Northwest. If salmon populations were restored sufficiently to allow increases in commercial harvest, fishers and those in related industries would enjoy new business and

[15] Goodstein, E. and L. Matson. 2007. "Climate Change in the Pacific Northwest: Valuing Snowpack Loss for Agriculture and Salmon." In J.D. Erickson and J.M. Gowdy, eds., *Frontiers in Ecological Economic Theory and Applications.* Northampton, MA: Edward Elgar.

job opportunities in Oregon, Washington, and elsewhere along the salmon's migration routes. Further benefits accrue to recreational anglers and all residents of the Pacific Northwest who benefit from the clean water, flood control and open spaces associated with salmon habitat. Since the values of many of these benefits accruing from salmon habitat are not captured by market prices, economists must employ different methods to measure the aggregate benefits that salmon and steelhead provide to the Northwest. Hence, the household surveys provide a means to estimate the extent to which Northwest residents value salmon and enhancements to salmon habitat.

Economists describe economic benefits of ecosystem goods and services, such as the benefits of protecting salmon and steelhead habitat, using various methods. Established markets exist for some benefits, such as increases in the supply of goods, e.g., commercial harvests of fish. In these cases, we can interpret market prices as a measure of the economic benefit of actions that protect or increase the supply of the good. We note, however, that factors such as externalities (e.g., when prices do not include pollution impacts) or government intervention (e.g., when subsidies artificially elevate prices) can distort market prices.

Measuring the economic significance of benefits for which markets do not exist, such as cultural values, amenity values, and the recreational value of sport fishing, is more challenging. Economists have developed techniques that can approximate the economic values of some of these benefits. These techniques have been tested and improved over the decades, with results and methods vetted through publication in academic journals and presentations at scholarly conferences.[16] We describe some of the more commonly used techniques in more detail in our discussion of the sport fishing and existence values of salmon and steelhead.

1. COMMERCIAL FISHING VALUE OF ROGUE RIVER SALMON

Although the market price for wild salmon provides a reasonable starting point for calculating the commercial fishing value of a Pacific Northwest salmon or steelhead, many factors complicate the calculation. Salmon are often caught far from the streams in which they were spawned. Since many Pacific Northwest salmon are caught in the ocean near Alaska and Canada, estimates of the contribution of Northwest-spawned salmon to the total Pacific catch must be made.

[16] For more information on the methods of measuring economic benefits that are not traded in markets, see The National Research Council. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems, National research Council; Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being*; and Barbier, E.B., et al. 1997. *Economic Valuation of Wetlands*. Ramsar Convention Bureau, Department of Environmental Economics and Environmental Management, University of York, Institute of Hydrology, IUCN-The World Conservation Union.

Table 5 shows the results of studies conducted by the Independent Economic Analysis Board (IEAB) (2005)[17] and Radtke and Davis (1995 a). In each of these studies, the authors estimate the economic impact that commercial-caught salmon and steelhead has on the Northwest economy.[18] Both studies focus on Columbia River Basin fisheries.

Table 5: Economic Value of Commercial-Caught Salmon and Steelhead, Estimates from the Academic Literature

Study	Species	Location	Average weight	Ex-vessel price per lb	Per Fish Economic Value ($2007)*
Radtke & Davis, 1995 a	Chinook	WA. Coast	11.51	$2.56	$64.95
Radtke & Davis, 1995 a	Chinook	WA. Coast	23.53	$1.09	$78.14
Radtke & Davis, 1995 a	Chinook	OR. Coast	11.4	$2.53	$68.14
Radtke & Davis, 1995 a	Coho	OR. Coast	4.56	$1.18	$13.64
IEAB, 2005	Coho	WA. Ocean	3.8	$1.84	$15.29
IEAB, 2005	Coho	OR. Ocean	5.8	$1.89	$21.34
IEAB, 2005	Coho	CA. Ocean	5.9	$1.89	$25.28
IEAB, 2005	Chinook	WA. Ocean	12.2	$2.17	$59.14
IEAB, 2005	Chinook	OR. Ocean	11.2	$2.17	$51.48
IEAB, 2005	Chinook	OR. Ocean	11.2	$2.17	$51.48
IEAB, 2005	Chinook	CA. Ocean	11.6	$2.51	$65.86
IEAB, 2005	Steelhead	B.C. Ocean	7.00	$1.67	$27.28

ECONorthwest compilation of various studies

Table 6 shows the estimated economic impact to the Northwest of salmon and steelhead caught commercially in coastal areas of the Northwest (excludes British Columbia and Alaska). The total estimated economic impact is not great—only $1.36 million, but represents a lower bound estimate as the estimates of the number of Rogue River fish commercially harvested off the Northwest coast is conservatively estimated.

[17] Independent Economic Analysis Board. 2005. *Economic Effects from Columbia River Basin Anadromous Salmonid Fish Production*. Document IEAB 2005-1.

[18] The regional economic impacts include wages, proprietor's incomes, rents, interest and dividends.

Table 6: Per-Fish and Total Economic Impact of Commercially Caught Rogue River Salmon,* 2007 Dollars

Species	Harvest of Rogue River-Spawned Fish	Per-Fish Economic Impact	Total Economic Impact
Coho	3,299	$19	$62,307
Chinook	20,264	$63	$1,271,379
Steelhead	1,040	$27	$28,360
Total	24,603		$1,362,046

Source: ECONorthwest analysis of data from studies shown in Table 5 and data from Oregon Department of Fish and Wildlife (http://www.dfw.state.or.us/resources/fishing/sportcatch.asp)

*Does not include economic impacts associated with Rogue River-spawned salmon and steelhead commercially harvested in Pacific Ocean off the Canadian or Alaskan coast.

2. SPORT FISHING VALUE OF ROGUE RIVER SALMON

The sport fishing value of Rogue River salmon is primarily a function of the pleasure derived from the fishing experience and is significantly greater than the commercial value, as measured on a per fish or per pound basis. Based on estimates from several peer-reviewed studies of sport fishermen, the average value of a Northwest salmon or steelhead is approximately $245 expressed in 2007 dollars.

The total value of a salmon or steelhead to a recreational angler is the dollar amount that the angler is willing to pay to fish for it. Economists typically decompose the total value into two parts: the first part is the amount the angler *actually* spends to fish.[19] In most cases, however, recreational anglers are willing to spend more than they actually do to fish. The difference between what an angler is willing to pay and what he or she actually pays is referred to by economists as *consumer surplus*, and represents the second part of the total value of a sport-caught salmon. It is important to measure consumer surplus because it represents a real gain in overall economic well being above that which is observed in market transaction by those engaging in sport fishing. Consumer surplus is a means of recognizing that for many anglers, the economic value associated with the enjoyment of fishing is greater than the sum of the market-based transactions undertaken to go fishing. Thus, fishing-related expenditures alone do not account for the entire economic benefits derived from the fishing experience.

Table 7 shows the results of several studies conducted in the Pacific Northwest to estimate the value of salmon to sport anglers. The results varied depending on the location of the study and the method of evaluation employed. However, even the most conservative calculations show that the recreational value of salmon and steelhead fishing is far greater than the market (purchase) price for salmon or steelhead.

[19] Note: this amount is accounted for in the "Regional Economic Impacts of Recreation on the Wild and Scenic Rogue River."

Table 7: Estimates of the Economic Value of Sport-Caught Salmon and Steelhead from Various Studies, 2007 Dollars

Study	Location	Species	Study Method	WTP Per Fish ($2007)
Olsen et al., 1990	Washington Ocean	Salmon	CVM	$63.60
Meyer et al., 1983	Oregon Ocean	Steelhead	TCM	$154.32
Olsen et al., 1990	Oregon Coastal	Steelhead	CVM	$97.92
Olsen & Richards, 1992	Rogue River	Fall Chinook	CVM	$103.64
Meyer et al., 1983	Rogue River	Fall Chinook	TCM	$57.04
Meyer Resources, 1987	San Fran. Bay/ Sacramento & San Joaquin Rivers	Chinook	CVM	$684.65
Meyer Resources, 1987	California statewide	Chinook	CVM	$307.37
Meyer Resources, 1987	North Coast Streams	Chinook	CVM	$307.37
Olsen et al., 1990	Washington Freshwater	Salmon	CVM	$56.13
Meyer Resources, 1985	Sacramento and San Joaquin Rivers	Salmon	TCM	$302.76
Meyer et al., 1983	Columbia River	Salmon	TCM	$200.23
Olsen et al., 1990	Columbia River	Salmon	CVM	$69.83
Meyer et al., 1983	Oregon	Steelhead	TCM	$234.68
Olsen & Richards, 1992	Rogue River	Steelhead	CVM	$128.18
Meyer et al., 1983	Rogue & Illinois	Steelhead	TCM	$208.88
Meyer Resources, 1985	Sacramento and San Joaquin Rivers	Steelhead	TCM	$896.19
Meyer Resources, 1986	California, Statewide	Steelhead	TCM	$909.83
Donnelly et al., 1985	Idaho, statewide	Steelhead	CVM	$42.04
Meyer et al., 1983	Columbia River	Steelhead	TCM	$320.28
Olsen et al., 1990	Columbia River	Steelhead	CVM	$202.49
Olsen & Richards, 1992	Rogue River	Half-Pounder*	CVM	$16.73
Olsen & Richards, 1992	Rogue River	Steelhead	CVM	$33.86

ECONorthwest compilation of various studies

Although not shown here, recreational fishing also impacts the local and regional economies through the multiplier effect.[20] Dollars spent by recreational anglers on fishing supplies, food and lodging create income for local businesses and provide income and salaries for local residents. Consequently, public policy and decisions makers should take into account how decisions which impact salmon and steelhead habitat will impact sport angling and other related recreational activities that have a wider scope of influence in the economy than the market value of salmon alone.

Table 8 shows the annual WTP by sport anglers for Rogue River salmon and steelhead based on information presented in Table 7. Given the unique

[20] For information on the economic impact that sport fishing on the Rogue River has on the Josephine County and Oregon economies, please see "Regional Economic Impacts of Recreation on the Wild and Scenic Rogue River."

wilderness experience offered by the Wild Rogue, the per fish and total willingness to pay (WTP) shown in Table 8 are likely low for that section of the river.

Table 8: Estimated Annual WTP by Sport Anglers for Rogue River Salmon, 2007 Dollars

Species	Catch Location	Estimated 2007 Catch	WTP Per Fish	Estimated Total WTP	Upper Bound WTP
Coho	Ocean	6,488	$64	$412,696	$412,696
	River	1,200	$157	$188,732	$363,404
Chinook	Ocean	5,355	$64	$340,600	$340,600
	River	15,988	$232	$3,711,003	$10,946,101
Steelhead	Ocean	1,040	$126	$131,130	$160,447
	River	4,165	$299	$1,246,599	$3,789,289
Total Sport Fishing		34,236		$6,030,759	$16,012,535

Source: ECONorthwest analysis of results from studies presented in Table 7 and data from Oregon Department of Fish and Wildlife (http://www.dfw.state.or.us/resources/fishing/sportcatch.asp)

3. NON-USE VALUE OF ROGUE RIVER SALMON

Even those who do not consume salmon or steelhead may benefit from their existence. In fact, the non-use value of an environmental resource is often far greater than it's commercial or sport value. Non-use value can take several different forms: option value, which is the value of saving a good for use at another time; bequest value, the value of saving a good for future generations; altruistic value, the value of saving a good for others to use now; and existence value, the value of saving a good for the sake of its existence[21]. Surveys indicate that, in aggregate, residents of the Pacific Northwest and California place a much higher non-use value on salmon than they do use value. Only a relatively small proportion of West Coast residents participate in fishing for salmon and steelhead. Thus there are many fewer households over which to aggregate total value. For example, based on information from the *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Oregon*, 455,000 Oregonians age 16 or older participated in fishing in 2006, out of a 16+ population of 2,894,050. This represents only 16% of Oregon's 16 and older population[22]. Comparatively, based on household survey results, a much larger percentage of Oregonians (and Americans in general) value Northwest salmon even though they likely will never participate in salmon fishing or even view a wild salmon (see Loomis, 1999, Pate and Loomis 1997, Loomis 1996).

[21] Schuhmann, P.W. and K.A. Schwabe. 2002. "Fundamentals of Economic Principles and Wildlife Management." In L. Clark, J. Hone, J.A. Shivik, R.A. Watkins, K.C. VerCauteren, and J.K. Yoder, eds., *Human Conflicts with Wildlife: Economic Considerations. Proceedings of the Third NWRC Special Symposium*. Fort Collins, CO: National Wildlife Research Center from http://www.aphis.usda.gov/ws/nwrc/symposia/economics/.

[22] U.S. Department of Interior, Fish & Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Oregon.*

Loomis (1999) estimated the marginal non-use value of salmon and steelhead on the Lower Snake River to residents of Oregon, Washington, and California[23]. The results of the analysis indicate that, as one would expect, the marginal value (i.e., the value of the next additional salmon) goes down as the total population of salmon goes up. At very low populations, (e.g. fewer than 5,000 total fish) the marginal value of an additional fish is more than $1.0 million. This immense per-fish value embodies the scarcity associated with a small fish population and society's desire to preserve the species for current and future generations.

Based on the results of the survey analysis and through the incorporation of information from other surveys, Loomis (1999) developed a *marginal WTP benefit function*, which provides estimates of the marginal value of a fish based on the size of the underlying population. He then demonstrates that as the underlying population increases, the marginal value that society places on increasing the population by one fish decreases. For example, based on a salmon population of 500,000, the marginal value of one additional fish is $1,595. However, the marginal value of a second additional fish (e.g., the marginal value based on a salmon population of 500,001) is only $1,539.

Loomis (1999) developed the marginal WTP benefit function based on analysis of society's WTP to increase the salmon populations on the lower Snake River. Based on comments from one or more reviewers of his analysis, he contends that the benefit function may in fact be representative of the entire Pacific Northwest salmon population. What this means is that, though there are many distinct populations of salmon throughout the Pacific Northwest, many Northwest and California residents do not differentiate between salmon of various populations. Society's concern is for the overall welfare of salmon populations throughout the Northwest. Thus, the value that society places on the marginal fish returning to spawn in any one Northwest river is a function of the aggregate count of all salmon returning to spawn in all Northwest rivers. The result of embracing the assumption that society views all Northwest salmon as members of one Northwest-wide population, is that society's WTP for the marginal salmon of any actual (biological) population will be lower than if society viewed each biological population separately.

To estimate the society's non-use WTP for Rogue River salmon and the value society places on the entire population of Rogue River salmon we embrace the all-Northwest assumption regarding the WTP benefit function for Rogue River salmon. In doing so, we acknowledge that our estimates of the non-use or existence value represents a lower bound estimate of the actual non-use value society places on Rogue River salmon. That is, although we are unsure of society's actual non-use WTP for Rogue River salmon, we are confident

[23] Loomis reviewed and augmented survey data from three other studies which asked households in the Pacific Northwest and California how much they were willing to pay for a specified increase in the number of either salmon or salmon and steelhead on a given river as a result of dam removal. None of the fish in these studies were endangered which is an important consideration when relating the results of these studies to other rivers since individuals will likely place greater existence value on an endangered species than on a non-endangered species.

that it is no lower than and may be much higher than the estimated value based on the WTP benefit function developed by Loomis (1999).

Table 9 shows the estimated marginal and average values of Rogue River salmon, as well as the total value of the Rogue River fishery based on various assumptions about the entire population of Northwest salmon. To our knowledge, "official" estimates of the aggregate population of Northwest salmon are not available.[24] However, based on escapement counts[25] for the Columbia River system from the Pacific Fishery Management Council (PFMC), we estimate the 10-year average annual salmon escapement for the Northwest to be approximately 830,000 fish.[26] Based on this estimate of the Northwest salmon population, we estimate society's annual marginal non-use WTP for a Rogue River salmon to be $1,008, the average WTP to be $1,824, and the total annual non-use WTP of the entire Rogue River salmon fishery to be just over $1.5 billion.

At first glance, these numbers appear to be very large. However, consider that these estimates are aggregated across the entire population of Oregon, Washington, and California—more than 46 million people in 2007. The per-person value of the entire Rogue River salmon fishery is $32.37 per year. Another perspective from which to view the annual value of the fishery is to compare it to the economic output of the 3-state region. Based on Bureau of Economic Analysis data (BEA), the combined gross state product of the three states was $2.28 trillion. The estimated annual value of the Rogue River fishery represents a mere 0.07% of the total annual output for 2007.

[24] We define "aggregate population" as the 10-year average salmon escapement summed across all Northwest river systems.

[25] Escapement is the annual count of salmon and steelhead returning to their spawning ground or hatchery.

[26] The PFMC 2007 report can be found at: http://www.pcouncil.org/salmon/salsafe.html.

Table 9: Annual Non-Use Value of Rogue River Salmon, 2007 Dollars*

Assumed Northwest Salmon Population	Marginal Value of a Rogue River Salmon	Average Value of a Rogue River Salmon	Total Value of Rogue River Salmon Population
500,000	$1,595	$4,892	$2,446,138,182
750,000	$1,112	$2,217	$1,662,959,665
828,282	**$1,008**	**$1,824**	**$1,514,072,103**
1,000,000	$822	$1,266	$1,266,345,698
1,250,000	$793	$821	$1,026,859,060
1,500,000	$525	$576	$863,315,110

Source: ECONorthwest analysis of results from Loomis, J. 1999. *Recreation and Passive Use Values From Removing the Dams on the Lower Snake River to Increase Salmon.* Agricultural Enterprises, Inc. for the Department of the Army Corps of Engineers; data from the Pacific Fishery Management Council (http://www.pcouncil.org/salmon/salsafe.html) and data from Oregon Department of Fish and Wildlife (http://www.dfw.state.or.us/resources/fishing/sportcatch.asp).

* Consistent with the results of the WTP salmon question in the 1996 through 2006 Oregon Population Surveys, we assume no inflationary growth in the WTP between 1996 (the data year of the Loomis 1999 study) and 2007.

Table 9 also provides estimates of the value of Rogue River salmon based on alternative assumptions regarding the size of the entire Northwest salmon population. The declining values associated with increasing salmon populations shown in Table 9 are consistent with economic principles of diminishing marginal value. Under an assumption of relative scarcity (e.g. a total average annual escapement of 500,000 salmon across all Northwest rivers), the marginal value of Rogue River salmon is greater. And under the alternative assumption of relative abundance (e.g. 1.5 million salmon), the marginal value of Rogue River salmon is less. Stated another way, as local, regional, and oceanic conditions worsen for Northwest salmon, the value of the next Rogue River salmon increases.

While the results of Loomis' study provide insight into the values society place on salmon in general, it is important to realize that all salmon populations in the Northwest may not be valued the same. A 2005 report by Goodstein and Matson[27] summarized and augmented research by Layton, Brown, and Plummer in 1999 on people's willingness to pay for specific salmon restoration projects. Goodstein and Matson (2007) used these data to find the perceived economic benefit of restoring salmon populations or, alternatively, of avoiding further declines in salmon populations and they extended the data collected from Washington and Oregon households to households nationwide by assuming that residents outside of Oregon and Washington, on average, placed a value on salmon restoration equal to half that of Oregon and Washington residents. This is a conservative assumption according to other studies on the value of Pacific Northwest salmon for residents outside of the Northwest region. Table 10 summarizes their findings.

[27] Goodstein, E. and L. Matson. 2007. "Climate Change in the Pacific Northwest: Valuing Snowpack Loss for Agriculture and Salmon." In J.D. Erickson and J.M. Gowdy, eds., *Frontiers in Ecological Economic Theory and Applications.* Northampton, MA: Edward Elgar.

Table 10: The Economic Benefits of Restoring Salmon Populations and of Preventing Further Declines in Salmon Populations

The economic benefits to residents of Oregon and Washington of restoring salmon populations:	
Columbia River Salmon	$2,890 per fish
Washington Coastal Chum Salmon	$872 per fish
Oregon Coastal Coho Salmon	$872 per fish
Rogue River Coastal Coho Salmon	$872 per fish
Puget Sound Chinook Salmon	$872 per fish
The economic benefit per year, to residents of Oregon and Washington, of preventing further declines in wild-salmon populations:	
Preventing a one-third decline in populations	$359 million - $3.6 billion
Preventing a two-thirds decline in populations	$718 million - $7.2 billion
The economic benefit per year, to residents of the U.S., of preventing further declines in wild-salmon populations:	
Preventing a one-third decline in populations	$5.4 billion - $54 billion
Preventing a two-thirds decline in populations	$10.9 billion - $109 billion

Source: ECONorthwest with data from Goodstein, E. and L. Matson. 2007. "Climate Change in the Pacific Northwest: Valuing Snowpack Loss for Agriculture and Salmon." In J.D. Erickson and J.M. Gowdy eds., *Frontiers in Ecological Economic Theory and Application*. Northampton, MA: Edward Elgar.

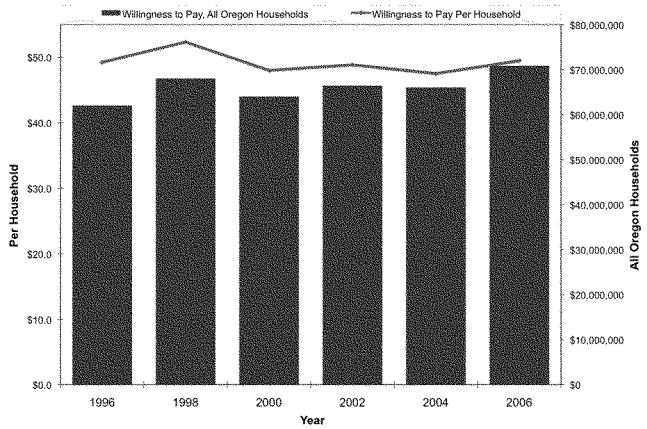
One of the disadvantages of the reports of non-use value viewed thus far is that they take data only from one point in time and do not allow us to observe how residents' willingness to pay for salmon recovery changes with changes in the economy and social structure. To observe trends in Oregonians' willingness to pay for salmon habitat restoration and improved water quality, we look at the Biennial Oregon Population Survey, conducted by the Oregon Office of Economic Analysis and the Oregon Progress Board. The survey provides data from as far back as 1996 and asks Oregon residents, how much per month they are willing to pay for water quality and habitat improvement efforts to help improve salmon runs in Oregon.

In 2006, the survey results showed, on average, that each Oregonian household was willing to pay $4.42 per month in 2008 dollars. Extending that value over the course of a year and multiplying the result by 1,333,723 Oregon households, indicates that Oregonians alone are willing to pay a total of $75,958,977 per year to improve salmon runs. Figure 2 shows the average annual amount Oregonians stated they are willing to pay for water quality and salmon habitat improvements based on the results of the Oregon Population Survey. The willingness to pay remains fairly constant (in nominal dollars) throughout the years for which data are available indicating that Oregonians are willing to make a long-term commitment to protecting and improving salmon habitat. It also indicates that Oregonians have a

continued concern for the health of salmon runs which has not diminished significantly over time.

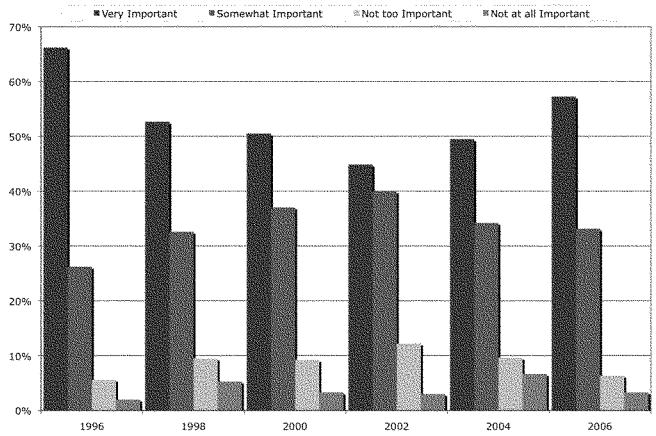
Figure 3 shows responses to another Oregon Population Survey question, "How important do you feel it is to improve salmon runs in Oregon?". It is noteworthy that in every year that the survey was conducted since 1996, over 80% of the respondents stated that improving salmon runs was very important or somewhat important and in all but two of the survey years, the majority of all respondents felt that improving salmon runs was very important.

Figure 2: Oregonian's Willingness to Pay for Water Quality and Habitat Improvement Efforts to Help Improve Salmon Runs in Oregon, In Current Year Dollars



Source: ECONorthwest with data from Oregon Progress Board. *Oregon Population Survey.* http://www.oregon.gov/DAS/OPB/popsurvey.shtml

Figure 3: How Important Do You Feel it is to Improve Salmon Runs in Oregon?



Source: ECONorthwest with data from Oregon Progress Board. *Oregon Population Survey.* http://www.oregon.gov/DAS/OPB/popsurvey.shtml

As shown by numerous surveys and studies, the continued existence of salmon and steelhead in the Pacific Northwest is very important to the local residents and is likely important to residents throughout the country. The non-use value reported in these studies has remained fairly steady over the past ten years and will likely remain so in future years. Consequently, government policies that preserve and/or enhance existing salmon and steelhead habitats have far-reaching benefits, which may not be captured by the market and these benefits will be felt by residents for many years to come.

SUMMARY

The findings of this report show that Rogue River salmon and steelhead are valuable assets to the Pacific Northwest with economic benefits that extends far beyond their market price. The commercial fishing industry for salmon and steelhead brings income into the regional economy through direct revenues and employment and is further increased by the multiplier effect. We estimate the economic value of the Rogue River to the commercial salmon fishery to be not less than $1.36 million annually.

The economic benefits society accrues from recreational fishing are even greater since the consumer surplus for each salmon and steelhead caught is typically greater than the angler's expenditures. Based on analysis of the academic literature, which includes studies of the sport value of salmon and

steelhead throughout the Northwest, we estimate the annual value of all Rogue River salmon runs to be not less than $16 million.

By far, the most significant value associated with Rogue River salmon, is the non-use value to residents of Oregon, the Northwest, and the entire west coast. Based on the results of peer-reviewed, published studies and data from household surveys, we estimate the implicit value of all Rogue River salmon and steelhead runs to be approximately $1.5 *billion*—significantly greater than the total use value of Rogue River salmon. Households in the Pacific Northwest indicate they are willing to pay over eight hundred dollars per fish for salmon preservation and Oregonians consistently state a willingness to pay at least $70 million annually to enhance salmon habitat in the state.

Northwest salmon face the risk of extinction, in part, because healthy salmon habitat is scarce. As the supply of healthy salmon habitat diminishes and the risk of extinction increases, the marginal economic values associated with the remaining salmon and the cost of protecting remaining habitat will only grow. Any increase in the risk of extinction would put negatively impact both the widely-recognized economic values of salmon discussed in this report, as well as the values that Congress recognizes to be "incalculable,"[28] including the spiritual, cultural, and health-related values that tribal members and others place on salmon and their habitat.[29] Protecting salmon habitat in the Wild & Scenic section of the Rogue River would reduce the risk of extinction of Northwest salmon.

---

[28] House of Representatives. 1973. Report No. 93-4112. Pp.4-5.

[29] *See*, for example, Meyer Resources, Inc. 1999. *Tribal Circumstances & Impacts from the Lower Snake River Project: Executive Summary*. Columbia River Inter-Tribal Fish Commission. October.

"Despite the deprivations summarized previously, today, salmon remain connected to the core of tribal material and spiritual life. Faced with bleak present circumstances, and severely limited prospects for remedy, the tribal peoples still look first to the salmon with hope of a better future.

"Traditional activities such as fishing, hunting and gathering roots, berries and medicinal plants build self-esteem for Nez Perce peoples – and this has the capacity to reduce the level of death by accident, violence and suicide affecting our people. When you engage in cultural activities you build pride. You are helped to understand 'what it is to be a Nez Perce' – as opposed to trying to be someone who is not a Nez Perce. In this way, the salmon, the game, the roots, and the berries and the plants are the pillars of our world." –Leroy Seth, Nez Perce Elder

BIBLIOGRAPHY

Atkinson, S.E. et al. 1992. "Bayesian Exchangeability, Benefit Transfer, and Research Efficiency." *Water Resources Economics* 28 (3): 715-722.

Boyle, K.J. and J.C. Bergstrom. 1992. "Benefits Transfer Studies: Myths, Pragmatism, and Idealism." *Water Resources Research* 28 (3): 657-663.

Brookshire, D. and H.R. Neill. 1992. "Benefit Transfers: Conceptual and Empirical Issues." *Water Resources Bulletin* 28 (3): 651-655.

Brouwer, R. 2000. "Environmental Value Transfer: State of the Art and Future Prospects." *Ecological Economics* 32: 137-153.

Desvouges et al. 1992. "Benefit Transfer: Conceptual Problems in Estimating Water Quality Benefits Using Existing Studies." *Water Resources Research* 28 (3): 675-683.

Donnelly, D., J. Loomis, C. Sorg, and L. Nelson. 1985. *Net Economic Value of Recreational Steelhead Fishing in Idaho*. Rocky Mountain Forest and Range Experiment Station, Resource Bulletin RM-9. USDA Forest Service.

Fedler, A.J. 1994. *Economic Value of Recreational and Commercial Use of Pacific Anadromous Fish in Washington, Oregon, California and Idaho*. American Sportfishing Association for USDA Forest Service.

Forest Ecosystem Management Assessment Team. 1993. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Land Management, and Environmental Protection Agency. 794-478. July.

Goodstein, E., B. Doppelt, and K. Sable. 2000. *Saving Salmon, Saving Money: Innovative Business Leadership in the Pacific Northwest*. Center for Watershed and Community Health, Portland State University. January.

Goodstein, E. and L. Matson. 2007. "Climate Change in the Pacific Northwest: Valuing Snowpack Loss for Agriculture and Salmon." In J.D. Erickson and J.M. Gowdy, eds., *Frontiers in Ecological Economic Theory and Application*. Northampton, MA: Edward Elgar.

Hanna, S. G. Sylvia, M. Harte, and G. Achterman. 2005. *Review of Economic Literature and Recommendations for Improving Economic Data and Analysis for Managing Columbia River Spring Chinook*. Draft ODFW Agreement No. 0005-4132S-Wild. Institute for Natural Resources, Oregon State University for Oregon Department of Fish and Wildlife. December 27.

Heyn, K. 2008. *White Paper on the Biological Contributions of Tributary Streams to the Wild Rogue River, Oregon*. American Rivers.

Heyn, K. 2008. *Save the Wild Rogue*. American Rivers.

House of Representatives. 1973. Report No. 93-4112. Pp.4-5.

Huppert, D.D. 1999. "Snake River Salmon Recovery: Quantifying the Costs." *Contemporary Economic Policy* 17 (4): 476-491.

Independent Economic Analysis Board. 2005. *Economic Effects from Columbia River Basin Anadromous Salmonid Fish Production*. Document IEAB 2005-1.

Johnson, R., H. Radtke, S. Davis, and R. Berrens. 1994. *Economic Values and Impacts of Anadromous Sportfishing in Oregon Coastal Rivers: Assessment of Available Information*. The Center for the Study of the Environment. February.

Judson, D.H., S. Reynolds-Scanion, and C.L. Popoff. 1999. "Migrants to Oregon in the 1990's: Working Age, Near-Retirees, and Retirees Make Different Destination Choices." *Rural Development Perspectives* 14 (2): 24-31.

Loomis, J. 1996. "Measuring the Economic Benefits of Removing Dams and Restoring the Elwha River: Results of a Contingent Valuation Survey." *Water Resources Research* 21 (2): 441-447.

Loomis, J. 1999. *Recreation and Passive Use Values from Removing the Dams on the Lower Snake River to Increase Salmon*. Agricultural Enterprises, Inc. for Department of the Army, Corps of Engineers, Walla Walla District. March.

Mazur, Steven. 2008. *Huntley Park Trend Data*. Email to T. Helvoigt. October 22.

Meyer, P.A., W.G. Brown, and C.K. Hsiao. 1983. *An Updating Analysis of Differential Sport Fish Values for Columbia River Salmon and Steelhead*. For The National Marine Fisheries Service.

Meyer Resources, Inc. 1985. *The Economic Value of Striped Bass, Chinook Salmon, and Steelhead Trout of the Sacramento and San Joaquin River Systems*. California Department of Fish and Game, Administrative Report No. 85-03. Sacramento, CA: Department of Fish and Game.

Meyer Resources, Inc. 1987. *An Economic Methodology for Valuing Salmon and Steelhead in California*. Report no. 129-J. For the California Advisory Committee on Salmon and Steelhead Trout.

Meyer Resources, Inc. 1999. *Tribal Circumstances & Impacts from the Lower Snake River Project: Executive Summary*. Columbia River Inter-Tribal Fish Commission. October.

Montgomery, C.A. and T.L. Helvoigt. 2008. *Trends in Oregonians' Willingness to Pay for Salmon*.

Montgomery, C.A. and T.L. Helvoigt. 2008. *Trends in Oregonians' Willingness to Pay for Salmon.*

NOAA's National Marine Fisheries Service. 2006. *Salmon Habitat.* Retrieved December 1, 2008, from http://www.nwr.noaa.gov/Salmon-Habitat/index.cfm.

NOAA's National Marine Fisheries Service. 2008. *Snapshot of Salmon & Steelhead ESA Status.* http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm.

NOAA's National Marine Fisheries Service Southwest Regional Office. *Southern Oregon/Northern California Coast Coho ESU.* Retrieved Nov. 20, 2008 from http://swr.nmfs.noaa.gov/recovery/Coho_SONCCC.htm.

Olsen, D., J. Richards, and R.D. Scott. 1990. *A Study of Existence and Sport Values for Doubling the Size of the Columbia River Basin Salmon and Steelhead Runs.* Columbia River and Tributaries Study – 73. Portland, OR: North Pacific Division, U.S. Army Corps of Engineers.

Olsen, D. and J. Richards. 1992. *Rogue River Summer Steelhead and Fall Chinook Sport Fisheries Economic Valuation Study.* Lake Oswego, OR: Pacific Northwest Project.

Oregon Business Council. 1993. *Oregon Values and Beliefs: Summary.* May.

Oregon Department of Fish and Wildlife, Roseburg. 2003. Letter to Ted Helvoigt.

Oregon Department of Fish and Wildlife, Fish Division. 2008. *Fish Counts.* Retrieved October 29, 2008 from http://www.dfw.state.or.us/fish/fish_counts/goldray/2006/gold_ray_dam._2006.asp.

Oregon Progress Board. *Oregon Population Survey.* http://www.oregon.gov/DAS/OPB/popsurvey.shtml

Pate, J. and J. Loomis. 1997. "The Effect of Distance on Willingness to Pay Values: A Case Study of Wetlands and Salmon in California." *Ecological Economics* 20: 199-207.

Radtke, H.D. and S.W. Davis. 1995a. *An Estimate of the Asset Value of Historic Columbia River Salmon Runs.* The Institute for Fisheries Resources. December.

Radtke, H.D. and S.W. Davis. 1995b. *Estimates of Economic Impacts from Ocean and Lower Estuary Commercial and Recreational Salmon Fisheries in 1995.* For Oregon Coastal Management Association, Inc. May.

Schuhmann, P.W. and K.A. Schwabe. 2002. "Fundamentals of Economic Principles and Wildlife Management." In L. Clark, J. Hone, J.A. Shivik, R.A. Watkins, K.C. VerCauteren, and J.K. Yoder, eds., *Human Conflicts with*

Wildlife: Economic Considerations. Proceedings of the Third NWRC Special Symposium. Fort Collins, CO: National Wildlife Research Center from http://www.aphis.usda.gov/ws/nwrc/symposia/economics/.

Smith, V.K. and S.K. Pattanayak. 2002. "Is Meta-Analysis a Noah's Ark for Non-Market Valuation?" *Environmental and Resource Economics* 22: 271-296.

Sullivan, P., D. Hellerstein, L. Hansen, R. Johansson, et al. 2002. *The Conservation Reserve Program: The Implications for Rural America*. United States Department of Agriculture, Economic Research Service. Agricultural Economic Report 834. September.

Sunding, D. *The Economic Impacts of Critical Habitat Designation*. Giannini Foundation of Agricultural Economics.

U.S. Department of Interior, Fish & Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. ***2006** National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Oregon.*

U.S. Environmental Protection Agency. 2000. *Guidelines for Preparing Economic Analyses*. 8677. September.

Weinhold, M. 1995. *Lower Rogue River Basin Watershed Condition Assessment*. Lower Rogue Watershed Council for State of Oregon Watershed Health Program and Strategic Water Management Group.

Regional Economic Impacts of Recreation on the Wild and Scenic Rogue River

Commissioned by the Save the Wild Rogue Campaign, with funding support from the Giles & Elise Mead Foundation

ECONorthwest
ECONOMICS • FINANCE • PLANNING

January 2009

Prepared by: Ted L. Helvoigt, Ph.D.,
Cleopatra Neculae,
Alec Josephson,
Diane Charlton

Date submitted January 22, 2009

ECONorthwest
ECONOMICS • FINANCE • PLANNING
99 W. Tenth, Suite 400
Eugene, OR 97401
(541) 687-0051

EXECUTIVE SUMMARY

In May 2008, the ***Save the Wild Rogue Campaign*** engaged ECONorthwest to analyze the economic impacts that recreation related spending on the Wild & Scenic Rogue River has on the Josephine County and Oregon economy. As part of the analysis, we conducted two surveys, one of commercial rafting outfitters and another of local lodging establishments. The results of the economic impact analysis and the surveys show that Josephine County and the state of Oregon enjoy direct economic benefits from recreational activities on the Rogue River. Among the findings summarized in this report are the following:

- River-based recreation on the Wild & Scenic Rogue River, which includes rafting, fishing, hiking, and jetboat tours, accounted for not less than $30 million in total economic output, including $15.4 million in personal income, and 445 full- and part-time jobs.
- Oregon-based outfitters were responsible for 91% of commercial activity on the Wild Rogue. Of this, outfitters based in Josephine County were responsible for 38%.
- Approximately 93% of guests on commercial rafting and fishing trips came from areas outside of southwestern Oregon and 72% came from outside of Oregon.
- Visitors to the Wild and Scenic Rogue accounted for three out of every four lodging guests in the local area during the four-month Wild Rogue permit season (May 15 through October 15).
- The designation of this portion of the Rogue River as a National Wild and Scenic River has contributed to the long-run economic growth in Josephine County and southwestern Oregon.
- It is likely that increased federal protection of critical tributaries to the Wild Rogue would not only have positive short-run economic effects, but would further enhance the long-run economic benefits accruing to Josephine County and the State of Oregon.

This study focuses on one component of the myriad of economic benefits the Wild & Scenic Rogue River provides to Oregon's residents and businesses: *the economic activity associated with visitor spending*. The benefits highlighted in this analysis include only the short-run, market-based economic effects that flow from spending by visitors on river-based recreational activities. As such, the results of the study represent a small portion of the total economic value associated with protecting this important national treasure.

The values of other benefits, many of which are not market based, such as the services provided by the Rogue's ecosystem and the direct and indirect values of its salmon runs, are not examined in this report. These other values, however, certainly contribute to the overall net economic benefits enjoyed by residents of Josephine County, the State of Oregon, and the entire nation.

INTRODUCTION

The Rogue River, located in the southwestern corner of Oregon, flows approximately 215 miles from its headwaters in the Cascade Range, near Crater Lake, and reaches the Pacific Ocean at the city of Gold Beach. In 1968, Congress designated an 84-mile stretch of the Rogue River from the confluence with the Applegate River (seven miles downstream of the City of Grants Pass) to the Lobster Creek Bridge (11 miles upstream of Gold Beach) as a National Wild & Scenic River. The Rogue River was one of the original eight rivers included in the Wild & Scenic Rivers Act, which intended to protect from development or degradation certain rivers or river segments deemed of particular importance to the nation. Specifically, the Act states:

> *"It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dams and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes."*
>
> **Wild & Scenic Rivers Act, October 2, 1968**[1]

The management of the 84-mile Wild & Scenic corridor of the Rogue River is based on three levels of management intensity: Recreation, Scenic, and Wild. These designations define the physical accessibility of a particular section of the river, as well as the activities permitted on that section (BLM and Forest Service 2004):

- **Recreation River** is defined as a section of a river that is readily accessible by road, that may have some development along the shoreline, and that may have undergone some impoundment or diversion in the past.

- **Scenic River** is defined as a river section free of impoundments, with shorelines and watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

---

[1] As of 2006, the National Wild & Scenic River System protects more than 11,000 miles of 165 rivers in 38 states and the Commonwealth of Puerto Rico—less than one half of one percent of the nation's rivers.

- **Wild River** is defined as a section free of impoundments and generally accessible only by trail, representing vestiges of primitive America.

The Wild & Scenic Rogue River is divided into five sections. Each section is associated with one of the three management intensities. The five sections are shown in Table 1 beginning at the confluence with the Applegate River and proceeding downriver.

Table 1: Wild & Scenic Rogue River, Sections and Management Designations

Section of Wild & Scenic Rogue	River Miles	Management Designation	Part of Study Area?
1. Applegate River to Grave Creek ("Hellgate Recreation")	27.0	Recreation	Yes
2. Grave Creek to Watson Creek ("Wild Rogue")	33.8	Wild	Yes
3. Watson Creek to Blue Jay Creek	8.9	Recreation	No
4. Blue Jay Creek to Slide Creek	7.6	Scenic	No
5. Slide Creek to Lobster Creek	7.1	Recreation	No

Source: BLM and Forest Service 2004.

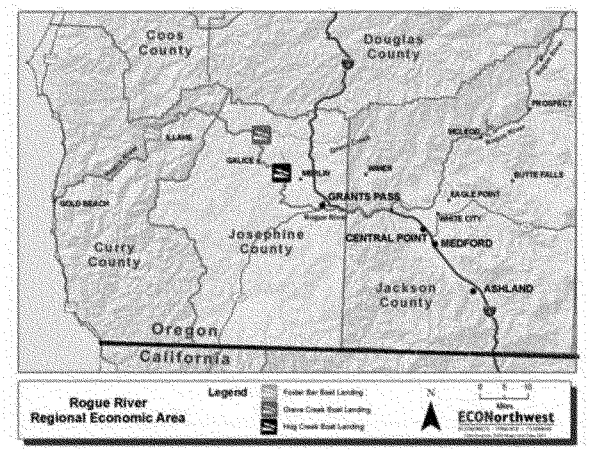
As Table 1 shows, this study is concerned with section 1 (hereafter referred to as "Hellgate Recreation"), which is entirely contained within Josephine County, and section 2 (hereafter referred to as the "Wild" section), which begins in Josephine County, but ends in Curry County. With respect to recreational activity, the two river sections differ in several significant ways. The Recreation section is accessible by road for most of its length. Commercial jetboats are active on the Recreation section throughout the summer-vacation season. There are no limits on the number of commercial or non-commercial rafters or fishermen using the river each day.

Comparatively, the Wild section is not accessible by road. Jetboat activity is not permitted on the Wild Rogue, except on the portion between Watson Creek upstream to Blossom Bar rapid.[2] Commercial and non-commercial rafters and fisherman are each limited to 60 person-starts each day on the Wild section during the May 15 – October 15 season. The Bureau of Land Management (BLM) and Forest Service jointly manage the Wild section, but the BLM has sole responsibility for managing the permit system. A permit is not required to run the Wild Rogue in the off-season.

[2] The number of commercial jetboats permitted into the Wild section is limited based on historic (pre 1968 Wild and Scenic Act) usage. Up to six daily commercial jetboat trips carry visitors from Gold Beach into the lower portion of the Wild Rogue. Each of the three lodges located below Blossom Bar rapid (Paradise Lodge, Half Moon Bar Lodge, and Clay Hill Lodge) also maintain one or more jetboats for transporting supplies to the lodges.

Figure 1 shows the geographic relationship between the Rogue River, Josephine County, and the rest of southwestern Oregon. As mentioned above, access to the first section, Hellgate Recreation, is unrestricted, but rafters prefer the stretch between Hog Creek and Grave Creek, shown in Figure 1. This segment is surrounded by public land, includes Hellgate Canyon, a popular visitor attraction, and, though relatively mild, contains the most exciting rapids on the 27-mile Hellgate section. Rafters usually cover the distance of almost 14.5 river miles in one day. The take-out point for the rafting trip on the Hellgate Recreation section is also the put-in point for the trip on the Wild section. The designated Wild section of the Rogue ends at Watson Creek, but boaters must continue for approximately one mile to the boat landing at Foster Bar (see Figure 1). Once off river, recreationalists are usually shuttled back to the Grants Pass area.

Figure 1: Josephine County, Oregon, and Landmarks on the Wild & Scenic Rogue



Economic Benefits Associated with the Wild and Scenic Rogue River

The Wild & Scenic Rogue River provides a myriad of economic benefits to the region's residents and to people well beyond the Rogue Valley. To fully account for the economic benefits of this stretch of river, one must consider the value of all the market-based economic activities associated with the river, of which recreation is only one, as well as the many non-market-based economic values, such as the ecosystem services, wildlife and fish habitat, scenic values, and existence and option values. The purpose of this study is to quantify only a portion of the market-based values—the economic impact of the direct economic activity associated with the Wild and Hellgate Recreation sections of the Rogue

River. The regions of interest for the study are Josephine County and the state of Oregon. While looking at Josephine County, the study area excludes the economic impacts on neighboring Curry County, which certainly experiences economic impacts from recreation on the Wild and Scenic Rogue River, and Jackson County, which contains the cities of Medford, the economic hub of southwestern Oregon, and Ashland, home of the Oregon Shakespeare Festival, a popular destination for visitors from around the U.S. The study then extends the analysis to the state of Oregon to show how Rogue River-based expenditures in Josephine County impact the entire state through increased economic activity and employment in associated industries.

This analysis focuses on the economic impacts that river-based recreation on the Rogue River has on the Josephine County and the Oregon State economies. The recreational activities we consider include:

- Whitewater rafting (quantify economic impacts)
- Fishing from a boat (quantify economic impacts)
- Fishing from the bank (discuss potential economic impacts)
- Hiking on the Rogue River Trail (discuss potential economic impacts)
- Commercial jetboat tours (quantify economic impacts)

Natural-Resource Amenities Contribute to Economic Growth

Traditionally it was assumed that lands protected from resource extraction, residential and commercial development, and other forms of direct economic action provide little or no economic benefits to local communities. This assumption relied on the notion that economic value is necessarily a function of resource extraction or other forms of direct commercial use. There is growing evidence, however, to suggest conservation-oriented uses of public lands and regulations limiting exploitation of privately owned lands, rather than commodity production and residential sprawl, may actually provide greater benefits to local economies. Recent research has demonstrated that, by protecting public lands and enhancing recreational opportunities in and around them, regional economies benefit and even expand. Economists at Oregon State University demonstrated that protecting natural areas benefits local economies in the Pacific Northwest in two ways (Kerkvliet et al. 2008). First, the authors found that rural counties with higher proportions of land conserved to protect biodiversity exhibit higher rates of employment growth. Second, they found evidence that the same rural counties also experience higher rates of net migrations. That is, more people move into those counties than leave. The authors also found that rural counties in the Pacific Northwest that were unable to diversify their local economies and relied heavily on timber harvesting experienced lower or even negative rates of employment growth and net migration.

Similar studies elsewhere in the country substantiate these results and confirm that, especially in the West, natural amenities explain the trajectory that rural counties have followed in terms of population and economic growth. For instance, a USDA study found that the existence of amenity features, such as a temperate climate, varied topography, and a strong presence of water areas, can explain population growth in rural counties in the last quarter of the twentieth century (McGranahan 1999). Additionally, another study found that, along with factors such as access to air travel and an educated workforce, designations that permanently protect public land play a decisive role in determining whether a Western rural county will experience economic growth (Rasker 2006). Another recent study looked at the socioeconomic impacts of recreation and tourism on the quality-of-life of rural-county residents (Reeder and Brown 2005). The authors found that recreation and tourism have a positive impact on rural communities, employment, and wages, and contribute to the reduction of poverty and to the improvement of education and health. The study also concluded that, on average, even though housing costs increase in these counties, gains in income offset such cost increases.

Research, such as the studies to which we refer above, confirms an economic reality that many rural communities experience today, namely that natural amenities and recreation foster sound economic growth and can create an economic buffer that protects them from the extremes of boom-and-bust cycles associated with natural-resource extraction. Kerkvliet et al. (2008) propose four non-mutually exclusive hypotheses to explain the mechanisms that lead from natural amenities to population and economic growth:

1. Conservation lands attract firms, whose employees value the resulting amenities;
2. Conservation lands may provide production inputs for recreation and other natural-based enterprises;
3. Firms may be attracted to a pool of workers, who, by migrating have expressed a willingness to trade income for amenities from conservation lands;
4. Environmental amenities may attract new residents with external sources of income.

A previous analysis by Partridge and Rickman (2003) confirms these assumptions, concluding that strong evidence indicates that employment opportunities follow population-migration trends almost as often as people move to follow jobs.

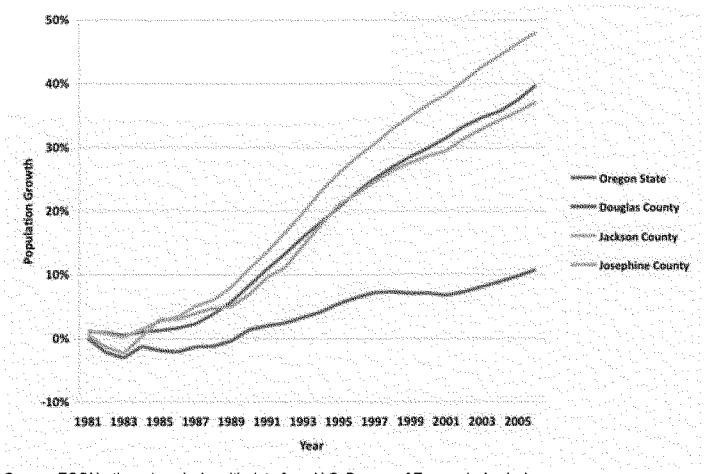
Josephine County Has Grown Since the Rogue's Designation as a Wild & Scenic River

Almost two thirds of the land area in Josephine County, or 692,000 acres, are federally owned and represent a source of economic activity. In the past, the main means to create jobs and income from forested public lands was related to

logging and wood-product manufacturing. In the last few decades, though, the industry has contracted and wood-product employment, including that from logging, declined from 20% of total employment in the mid-1970s to 4.1 percent in 2005 (Tauer 2006). Many Josephine County residents remain concerned about changes in the county's economy, as it has transitioned away from dependence on income derived from natural-resource extraction to a service-based economy. The belief that economic growth in the county suffers from the high concentration of public-land ownership with little to no timber harvesting on it subscribes to an old view of regional economic development, though, because it fails to recognize that these public lands have helped spur economic and population growth in the county over the past two decades.

Josephine County has numerous natural areas that are popular recreation sites. The county is home to two Wilderness reserves, Kalmiopsis and Red Buttes, Lake Selmac, and Oregon Caves National Monument, to name just a few. Of all natural attractions that draw tourists to Josephine County every year, the Rogue National Wild & Scenic River is its biggest asset. Many residents live in Josephine County to be near the river and many business owners have built a strong tourism industry around this natural treasure. Data from the Oregon Employment Department show that between 2001 and 2006, employment in the leisure and hospitality industry in Josephine County increased by 20%. Comparatively, overall employment growth in the county was only 15%.

Figure 2: Population Growth Since 1980, Josephine County with Comparison to Surrounding Counties and Oregon



Source: ECONorthwest analysis, with data from U.S. Bureau of Economic Analysis

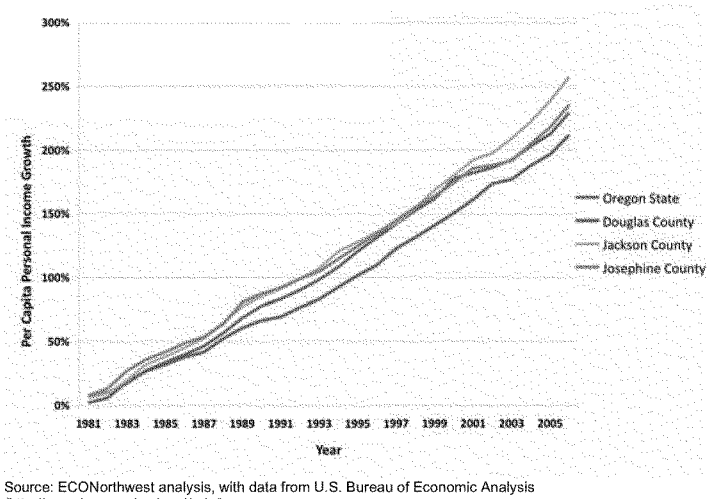
The county has exhibited both strong population growth, mainly influenced by in-migration, and vigorous income growth. Figure 2 shows that between 1980

and 2006 Josephine County experienced population growth comparable to that of the state as a whole. While population grew somewhat slower in Josephine County than in Jackson County, it grew considerably faster than Douglas County's population.

Josephine County also experienced substantial growth in per capita personal income over the past two and a half decades. Figure 3 shows a comparison of income growth between Josephine County, the two neighboring counties, and Oregon, as a whole. Nominal per capita income grew faster in Josephine County than in Douglas County but was not as strong as that in Jackson County. With few exceptions, income growth in Josephine County has generally remained just above the state average since 1980.

Forty years after Congress designated the 84-mile section of the Rogue as a National Wild and Scenic River, Josephine County's population and economy are still expanding. As Oregon Employment Department data indicate, employment in the tourism and recreation industries have contributed to this growth and it is likely that the growth is due in part to the federal designation. Although it is impossible to construct the counterfactual case of Josephine County without the Wild & Scenic River designation, it is not only likely, but indeed probable, that the growth in population and income enjoyed by the county's residents over the past four decades would have not have been as great.

Figure 3: Growth in Per Capita Personal Income Since 1980, Josephine County with Comparison to Neighboring Counties and Oregon



Source: ECONorthwest analysis, with data from U.S. Bureau of Economic Analysis (http://www.bea.gov/regional/reis/)

Past Studies on the Economic Impacts of River Recreation on Local Economies

Several studies have calculated the effects of the whitewater-recreation industry on local economies. Each study relied on survey data to estimate visitor expenditures and all used the IMPLAN input-output modeling system to calculate the economic impacts on the regional or state economies of spending by river-based recreationalists. All analyses found that the rafting industry made a substantial contribution to economic output, income, and employment in the respective regions.

In a study conducted by Johnson and Moore (1993), the authors calculated the total gross output, total income, and employment generated from whitewater activities on the Klamath River in Klamath and Jackson counties in Oregon using three different models. The first model calculated the total output, income, and employment based on expenditures by non-local visitors who rafted in the region during the 1988 season. The second model included expenditures by non-local and local visitors who rafted during the 1988 season. The third model, which should give the most reliable calculation, made adjustments for non-local visitors who would still visit the region even if rafting were not an option and also for local residents who would substitute another local activity if they could not raft. The authors noted that failing to adjust for non-local residents who would continue to vacation in the region even if they could not access the river would lead to an overestimate of the economic impacts of river recreation while a failure to account for locals who would otherwise leave for vacation and spend their money in another region if they could not access the river would lead to an underestimate of the economic impacts of whitewater recreation in Klamath and Jackson counties.

The third model produced lower calculations for output, income, and employment than the first and second models, demonstrating that the effects of substitution by non-local visitors is stronger than for local visitors and that consumer substitution effects can have a considerable impact on results. After making substitution adjustments, the third model calculated that the total (direct, indirect, and induced) output in Klamath and Jackson counties associated with whitewater recreation ranged from $490,500 to $817,400 in 1982 dollars, the total income ranged from $245,300 to $408,900 and the number of jobs created ranged from 16 to 26. The authors concluded that the Klamath River recreation provided an important stimulation to the local economies even after controlling for consumer substitutions.

A study by Cordell et al. (1990) focused on three National Park Service river recreation sites. The authors did not include expenditures by local residents in their estimates. They conducted a survey of river runners to determine what fraction of trip expenses were spent in various sectors of the local economy. They found that visitor spending increased total gross output by between $2.6 million and $13.4 million, total income by between $1.2 million and $5.6 million, and employment by between 60 and 292 jobs, depending on the park studied. Cordell

et al. also calculated the Type III multipliers for the gross output, total income, and employment at each park. The Type III multiplier is a measure of the total effects of recreational expenditures. They estimated that the total gross output multiplier ranged from 2.00 to 2.10, the total income multiplier from 2.16 to 2.36, and the employment multiplier from 1.57 to 1.84. Parks where whitewater recreation brought in greater revenue had larger multipliers. The results from this study show how expenditures in the river recreation industry can have a significant impact on the economy through indirect and induced impacts, as well as direct.

English and Bowker (1996) differed from the studies above in that they analyzed the impacts of guided whitewater rafting on state economies, rather than local economies. This study only calculated expenditures by non-local visitors, assuming that the effect of local rafters who would choose to vacation out of state if they could not raft in-state would be negligible. To control for non-local visitors who would still visit the area even if rafting were not an option, English and Bowker included in the analysis all expenditures by non-local visitors who cited rafting as the primary reason for their trips and only the rafting expenses and a few other minor purchases by non-local visitors who said that rafting was not the primary purpose of their trip. The results from this study show that whitewater rafting has a significant impact on the total gross output, the total income, and the employment which is consistent with the other two studies we reviewed. The total industrial output ranged from $94,500 (in 1992 dollars) for the Nantahala River to $2.25 million for the Middle Fork of the Salmon River. The Type III multipliers calculated from this study were similar to those found by Cordell et al. and ranged from 2.09 to 2.49 for total gross output, 2.03 to 2.43 for total income, and from 1.67 to 1.90 for employment.

A recent study, conducted by Hjerpe and Kim (2006), discussed the socioeconomic impacts of river trips in the Grand Canyon on nearby Coconino County and the neighboring cities of Peach Springs, Arizona, and Kanab, Utah. The authors decided not to discriminate between local and non-local visitors since both groups are subject to the permit system and the long waiting list to receive river-running permits prevents locals from using the river often. Hjerpe and Kim developed a mail survey for trip leaders on private (i.e., non-commercial) river trips and developed an expenditure survey for commercial outfitters that operate on the Grand Canyon. According to the study, commercial and non-commercial river running on the Grand Canyon generated $21.1 *million* in economic output in the local economy in 2001. The multipliers calculated in this study were lower than those reported by English and Bowker (1996) and Cordell et al. (1990). The total income Type SAM multipliers, which are comparable to the Type III multipliers and include employment-based Personal Consumption Expenditures, were 1.28 and 1.30 based on commercial and noncommercial boating respectively, the employment multipliers were 1.26 and 1.28, and the employee income multipliers were 1.28 and 1.24. One of the suggested reasons that the Grand Canyon had lower multipliers was the relatively high leakage rate (a measure of expenditures that are not retained in the local area). One of the reasons leakage is so high is because several of the large commercial outfitters are located outside of Coconino County in places like

Las Vegas, Salt Lake City, and California. Clearly these arrangements decrease the local spending. The authors also noted that studies like that of English and Bawker which analyze larger regional areas will report larger multipliers since a large region retains more expenditures than a small county would. Finally, Hjerpe and Kim discussed some of the adverse impacts of tourism on the Grand Canyon region, drawing attention to the fact that many of the jobs produced by the river-based recreational industry pay lower wages and that tourism often increases income inequality, demands for public infrastructure, and the cost-of-living. They emphasized the importance of diversifying the local industry in order to attract more high skilled and higher waged labor. However, they also pointed out the benefits of promoting activities such as rafting for their sustainable, and non-consumptive use of the natural setting.

The study by S.A. Whisman et al. (No date) on the economic impacts of commercial whitewater rafting in West Virginia further confirms Hjerpe and Kim's (2007) hypothesis that state multipliers will be significantly larger than local multipliers. Whisman et al. calculated the economic impacts of commercial whitewater rafting on the local region (within a fifty-mile radius of the river studied) and on the state of West Virginia as a whole. The local multipliers were similar to those found in the Grand Canyon, 1.47-1.48 for total output, 1.51-1.55 for personal income, and 1.25-1.29 for employment. Conversely, the cumulative statewide multipliers from the three rivers were 1.57 for total output, 1.59 for personal income, and 1.32 for employment. This underscores the importance of taking into account the relative size of the region being studied.

The findings from all of theses studies show that river recreation typically has significant impacts on the local economy at both the county and state levels. It produces local income and jobs, and it increases the total gross output. However, it is also important to note that neglecting the substitution effect for consumers who would select another activity or travel to another site if whitewater recreation were not available will significantly alter the results of an economic impact study. It is also important to study which industries are growing and their impacts on the growth of per capita income as mentioned by Hjerpe and Kim (2007). Nevertheless, all of the studies reviewed conclude that whitewater recreation provides a positive stimulus to the local economies through direct, indirect, and induced economic effects.

Previous Economic Studies on the Rogue River

Two economic-impact studies have been conducted on the Rogue River in the past thirty years. The Oregon State Marine Board commissioned a report in 1986 (conducted by David Palazzi) and the BLM commissioned a report by Economic Strategies Northwest in 1991. Although the expenditure data used for these reports has changed considerably in recent years, the methods and results remain relevant to our findings.

Both studies used IMPLAN to calculate the indirect and induced economic effects of whitewater recreation activities. The study by Palazzi (1986) divided expenditures into expenses for travel, shuttle costs, food and beverage costs,

lodging costs, and miscellaneous expenses. Palazzi reported, for the year 1985, a total visitor spending of $159,941, which, in turn, generated $215,950 in total income in Oregon (approximately $460,000 in 2007 dollars).

Economic Strategies Northwest (1991) used a method for calculating expenditures different from those used in other studies. The authors relied on studies from the local area specifically and the Pacific Northwest generally to calculate visitor spending based on major expenditure categories, such as lodging, restaurants, transportation, etc., and the types of activities they participated in. The report concluded that visitor spending in the Hellgate Recreation area generated over $26 million in total income and approximately 1,500 jobs in 1990. The authors further suggested that alternatives which enhance fishing and motorized and non-motorized boating in the Recreation area could double the local economic activity in the following decade compared to the 1990 level.

The results of these two studies demonstrate the variation possible when different methods are used to calculate the economic impacts of river-based recreation on the Rogue. The Palazzi study did not calculate the economic output associated with river running on the Wild Rogue, but it did sum the income associated with the Wild Rogue, which totaled near $216,000 (in 1985 dollars). The Economic Strategies Northwest study concluded that spending by visitors to Hellgate Recreation area led to over $26 million in economic output in 1990. Although the findings of these reports differ substantially, both show that the Wild & Scenic Rogue River makes a significant contribution to economic activity in the local area and produces a large number of jobs.

Survey of Local Businesses

In this chapter we present the results of two surveys conducted by ECONorthwest. The first was administered to commercial outfitters that provide trips on the Wild section of the Rogue River. The second survey was administered to lodging establishments in the Grants Pass/Merlin area. The Grants Pass area is the last main stop for recreationalists before they access the Wild Rogue.

Survey of Outfitters

Commercially guided rafting trips constitute a substantial portion of the recreational activity on the Rogue River. During the 2007 permit season, a total of 5,977 people floated the Wild section on commercially guided trips, representing 45 percent of total visitors. In the last 20 years, the number if visitors who rafted on the Wild section of the Rogue ranged between 42 percent in 1995 to 50 percent in 1987.

In May and June 2008, ECONorthwest conducted a phone survey of the commercial outfitters that led trips on the Wild section of the Rogue River. Outfitter selection was based on the level of commercial activity during the 2007 season. Twenty-one commercial outfitters were responsible for 95% of the commercial activity during that year and were selected for the survey. Of the 21 outfitters selected, 18 surveys were fully or nearly fully completed, with a response rate of 86%.[3]

The purpose of the survey was to gather quantitative and qualitative information about each of the outfitters' business related to trips on the Wild section of the Rogue. None of the questions were related to sensitive business information, and the respondents were free *not* to respond to any of the questions. A synthesis of the responses to some of the questions is presented below, organized by the four areas identified in the survey:

1. Outfitters
2. River Guides
3. Wild Rogue Trips
4. Guests

1. Outfitters

There are 46 commercial permits to operate rafting and fishing trips on the Wild Rogue. Each permit is based on historic use by outfitters prior to the enactment of the permit system in 1974. Each permit defines specific days when a river trip can begin ("starts") and the number of persons, including guides, which may

[3] Up to four attempts were made to reach the other three outfitters.

participate on that particular trip. Permits differ greatly in the number of start dates and the size of the starts. Currently, the 46 permits are associated with 30 outfitters that operate on the Wild Rogue.[4] The outfitter businesses differ substantially in size based on the number of visitors their permit(s) allow.

The outfitters also differ with respect to the location of their operation. Of the 22 largest outfitters operating on the Wild Rogue:

7 are based in Josephine County,

5 are based in Jackson County,

7 are based elsewhere in Oregon, and

3 are based in California.

Based on the activity of these companies during the 2007 season, we estimate that 42% of commercial rafting was conducted with a Josephine County outfitter. This is an important factor when estimating the economic impact of commercial rafting on the Josephine County economy because it allows us to allocate the portion of total revenue received by outfitters to that which flowed directly into the Josephine County economy.

Of the five surveys completed with outfitters based in Josephine County, four stated that outfitting on the Wild Rogue was their only or their primary source of income in 2007. The fifth stated that outfitting was his sole source of income in 2007, but the Wild Rogue constituted only 30% of his total business. Three of the five outfitters noted that the Hellgate Recreation section was an important part of their business and two of the five indicated that rafting-equipment rentals associated with the Hellgate Recreation or Wild Rogue and other miscellaneous sales were also important sources of income.

Comparatively, few outfitters based outside Josephine County stated that they run trips on the Hellgate Recreation section or rent rafting equipment for use on the Hellgate Recreation or Wild Rogue. The outfitters that did are located in Jackson County and none indicated that the Hellgate Recreation section or rental equipment were important parts of their businesses.

The survey also asked outfitters how important maintaining the Wild Rogue at its current level of environmental quality was to their business. Not surprisingly, all respondents stated that it is very important. According to the outfitters surveyed, many of their guests said they had chosen the Wild Rogue for their vacation because of its beautiful scenery, fishing, wildlife, and water quality. Any decrease in the quality of the water, wildlife habitat, or scenery would likely affect the decision of many would-be-visitors about floating the Wild Rogue.

---

[4] Outfitters operate under the *special use permits*. As such, the permits are associated with a particular company. The permits cannot be sold unattached to the company, however a company can be sold with the accompanying permit attached.

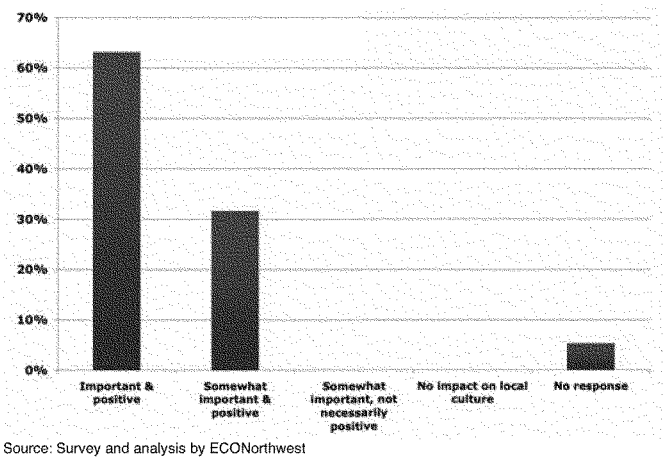
2. River Guides

A common criticism of the tourism industry in rural areas such as Josephine County is that it promotes low-wage jobs. Many of those employed in the rafting and fishing industry do earn annual incomes below the regional average and most jobs in the industry are seasonal. Nevertheless, most people enter the guiding profession knowing other jobs offer greater income potential. Guides must be able to communicate effectively and interact positively with guests, ensure all food and equipment needed for the trip is packed, deal with unforeseen circumstances, prepare meals, and safely guide guests down the river. Clearly, guiding is not a low-skill profession. So why do many people go into guiding? Because it offers many job characteristics not available in other industries.

Of those that go into guiding, some will remain in the industry for many years, working other jobs in the off-season. Others enter the industry when they are young and go on to other professions after several years. Many of the young people that work in the industry are students and guiding is an ideal summer job for them. Some that leave guiding as their primary job, move into professional employment, but still work one or more trips each year during the peak of the summer rafting season or as a fall fishing guide.

Regardless of the income earned by guides or the seasonality of the industry, guiding is an important part of the culture of the Grants Pass area. In fact, as Figure 4 indicates, the majority of the outfitters interviewed believe the occupation of river guide has an important and positive influence on the local culture. Only one outfitter did not respond to the question.

Figure 4: Perceived Importance of River Guiding to the Local Culture



Source: Survey and analysis by ECONorthwest

Based on the information provided by the outfitters surveyed, we estimate that about 65% of guides on the Wild Rogue are over the age of 30 and, of these, approximately 34% regard river guiding as their primary occupation. Of guides under 30 years of age, about half are students. Our survey also found that 14% of guides are teachers or other public school staff, who pursue guiding during summer breaks.

These findings demonstrate that although the tourism industry may pay lower than average wages, many guides dedicate time to this occupation because they value the lifestyle associated with it. This was confirmed by statements made by outfitters during the interviews. The fact that there are people who prefer guiding to other occupations indicates that there are aspects of guiding that offer non-monetary benefits large enough to offset the foregone wages from other employment.

It should also be noted that many fishing guides are self-employed, own their own boat and equipment, and contract out to the outfitters. Some of these guides also work as employees during the summer rafting season, thus earning income as both business owners and employees.

3. Wild Rogue Trips

Commercially guided trips down the Wild Rogue generally last between 3 days (42% of the trips) and 4 days (52% of the trips). The survey results indicate that about 66% of the trips include at least one overnight stay at a wilderness lodge along the Wild Rogue, while 34% of the trips offer camping as the only option for overnight stay, as shown in Figure 5.[5] The remaining 11% offer a combination of the two.

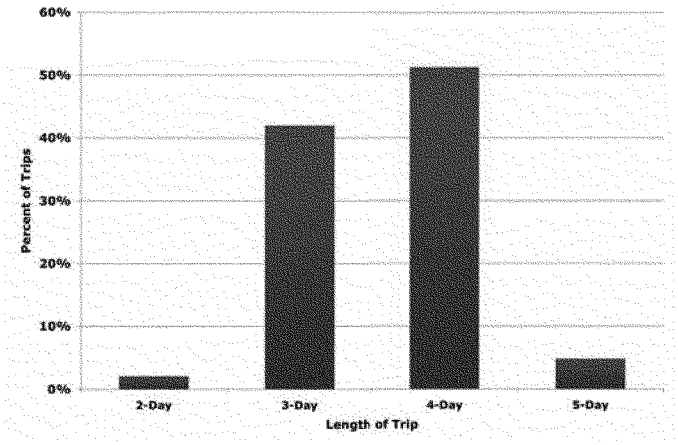
The BLM has collected data on the number of people who floated the Wild Rogue since 1994 when the permit system was instituted. Visitor numbers are segregated by commercial and non-commercial use and are shown in Figure 6. During the 35 years since the initiation of the permit system, visitor numbers have increased for both commercial and non-commercial guided trips. Part of the increase is due to the lengthening of the permit season in 1995 from 107 days to 154 days. This change in the management of the Wild Rogue is reflected in Figure 6. Since 1994, the number of commercially guided rafters has been basically flat and 1994 represents a peak in non-commercial usage.[6]

---

[5] Many outfitters offer a "camp-lodge" trip, which includes one or two nights of camping and one or two nights of lodging. There are five lodges located within the Wild Rogue corridor. This analysis does not measure the impact of the lodges independent of their business relationships with the rafting and fishing outfitters. Only one lodge, Black Bar, is definitely tied to the Grants Pass economy.

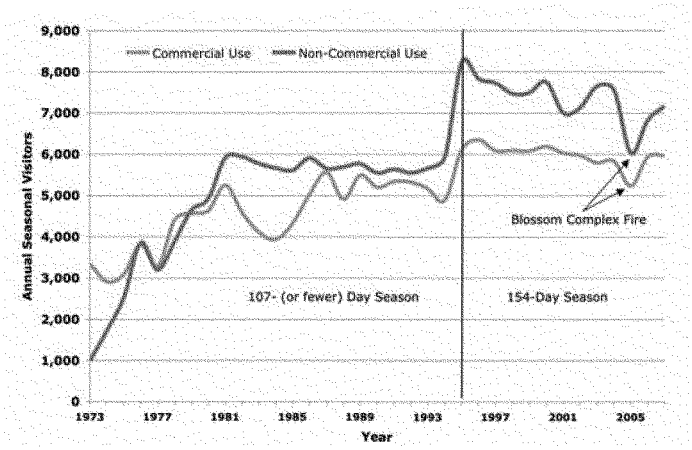
[6] 2005 appears to be an exception to this, but the drop in visitor numbers in that year is due to the nearly two-week closure of the Wild Rogue in August 2005 because of the management of the Blossom Complex fire. August is typically one of the two busiest months for most outfitters.

Figure 5: Length of Trips on the Wild Section of the Rogue River



Source: Survey and analysis by ECONorthwest

Figure 6: Historical Usage during Permitted Season on the Wild Rogue, Commercial and Non-Commercial River Runners



Source: BLM 2008.

Note 1: In 1995 the permit season was extended from 107 to 154 days (noted by black vertical line)

Note 2: The Wild Rogue was closed to visitors between August 11, 2005 and August 22, 2005 due to the Blossom Complex fire.

4. Guests

Overwhelmingly, most people that float on the Wild Rogue using a commercial outfitter come from outside of the state of Oregon. Figure 7 shows the distribution of commercially-guided visitors by place of origin; approximately 72% of visitors come from outside Oregon, 21% come from Oregon but outside the southwestern region of the state, and 7% come from southwestern Oregon (Jackson, Josephine, Curry, and Douglas counties).

The survey also asked outfitters several questions regarding the reasons their guests chose the Wild Rogue for their vacation, the comments guests made about the environmental aspects of the Wild Rogue, and any comments guests made which compared the Wild Rogue to other rivers providing a multi-day, wilderness experience. These comments are summarized below.

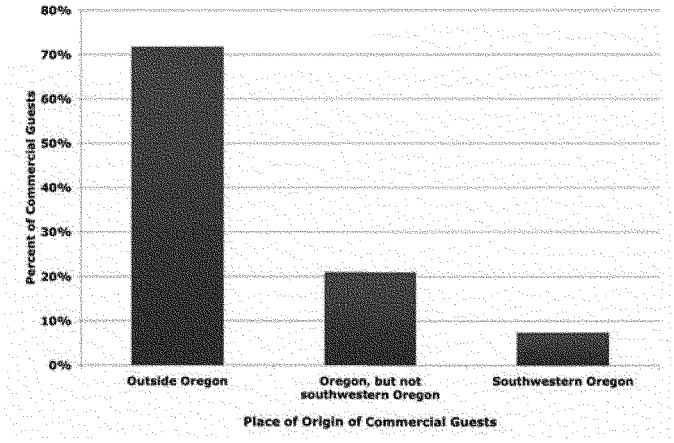
Why did your guests choose the Wild Rogue for their trip:

- Beauty of river and canyon
- Family friendly adventure
- Fishing and whitewater
- Reputation as a great family vacation
- Moderate whitewater
- Great weather
- Wildlife viewing
- The right length of trip
- The availability of the wilderness lodges
- Referral from friends
- Reputation as a premier river trip
- Proximity to major metro areas

Comments on the environmental aspects of the Wild Rogue:

- The river seems pristine
- Saw lots of wildlife
- Clarity of water not always so great
- Camp spots were nice
- The canyon seems unspoiled
- Scenery was beautiful

Figure 7: Place of Origin of Rafters Using Commercial Outfitters, 2007



Source: Survey and analysis by ECONorthwest

Survey of Lodging Establishments

ECONorthwest also developed a short telephone survey to solicit information from local-area lodging establishments on the impact of Rogue River-based recreation on their businesses. Names and contact information of lodging establishments in the Grants Pass—Merlin area were obtained from the state's tourism website.[7] A total of 20 establishments were identified. We attempted to contact all 20 businesses and successfully administered a total of 15 surveys, yielding a response rate of 75 percent.[8]

The responses of hotel-business owners in the local area can serve as a crosscheck to the more quantitative economic input-output analysis. Soliciting the input of local business owners also provides policy-makers with information on the perceptions of the business community regarding the economic importance of this natural and recreational resource.

Of the lodging establishments surveyed, all responded that the Rogue River is important or very important to their business. Several also identified the Wild

---

[7] Travel Oregon (http://www.traveloregon.com/). It should be noted that the 20 lodging establishments identified probably do not represent the universe of all lodging establishments in the local area. However, we do believe they likely are representative of the lodging establishments that cater to tourism.

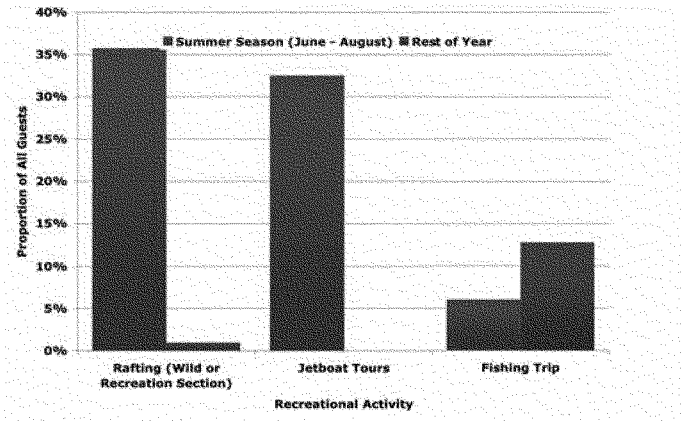
[8] Of the other five establishments, one had a disconnected telephone number and the other four did not answer and did not respond to our voicemail messages. Three attempts were made to contact each of these establishments.

Rogue as especially important to their business and the overall regional economy. Specific comments regarding the importance of the Rogue River to their individual businesses are as follows:

- "On a scale of 1 to 10, it (the Rogue River) is a 9."
- "The river is vital to our business."
- "The natural scenic beauty from Crater Lake to the Wild & Scenic section and beyond is a huge boon to the area."
- "The river is what brings people to Grants Pass for the summer months."
- "It is the key to our business."
- "This (the river) is the amenity that people come here to enjoy."
- "We have folks from all over the world come and visit. It has huge name recognition all over the world."

Our survey found that during the summer season, between June and August, whitewater recreationalists represent the main source of income for hotel owners. For instance, whitewater rafters that boated on either or both sections of the Wild & Scenic Rogue in 2007, represented 36 percent of all summer guests, jetboat tourists represented 33 percent and fishermen represented 12 percent, as Figure 8 indicates.

Figure 8: Recreational Guests at Local Lodging Establishments as a Percentage of All Guests, 2007



Source: Survey and analysis by ECONorthwest
Note1: Estimated proportions are not weighted by number of lodging guests in 2007.
Note 2: Does not include the wilderness lodges located in the Wild section.

The results of the two surveys show that the whitewater industry has a strong and positive influence on the culture and economy of Josephine County. These influences cannot be easily replaced with other industries or economic activities. Economic activity and culture in Josephine County are enhanced, not stifled, by the protection and national recognition of the Rogue River as a *National Wild and Scenic River*.

Economic-Impact Analysis of River-recreation Activities

The economic impact of river recreation on the economy in Josephine County and Oregon State was calculated using an input-output modeling approach. The approach is an economic modeling framework that calculates the direct, indirect, and induced economic effects associated with an industry sector, an individual business, or a proposed or actual project. The direct impacts account for all expenditures visitors to the river make. Indirect impacts include the impacts associated with all expenditures made by businesses in the local economy to buy inputs to meet the increased demand. Finally, the induced impacts account for all additional household expenditures on consumer goods in the region that are stimulated by the added income from the tourist activity.

Input-output models provide an empirical representation of an economy and the relationships among the various industry sectors, final consumers, and the larger (regional or national) economy. In order to model the input-output relationships of county and regional economies, special data techniques have been developed to estimate the necessary empirical relationships from a combination of national and county-level measures of economic activity. This planning framework, called IMPLAN (for IMpact analysis for PLANning), is commonly used in regional economic analyses. IMPLAN is also the software used in all of the published studies presented in the literature review.

Estimating the Number of Persons Who Floated on the Wild Rogue

First we analyze the economic impact of whitewater activities, both commercial and non-commercial, on the Wild section of the Rogue River on the economy of Josephine County. These activities include whitewater rafting and fishing.[9] Based on BLM data, during the 2007 permit season (May 15 through October 15), 13,147 rafters and fishermen floated this section of the Rogue. Of these, 5,977 (45%) were on commercial guided trips and the remainder, 7,170 (55%) boaters, organized and guided their trips independently without the use of a commercial outfitter.

Boaters also float on the Wild Rogue outside of the 5-month permit season. However, the only available data for the off-season usage is for October 2006 through May 2007. A total of 889 people floated the Wild Rogue during this period. However, the data are not divided into commercial/non-commercial visitors. It is necessary, therefore, to make two assumptions.

---

[9] Note: At least one outfitter (Rogue Wilderness) provides guided hikes of the Wild Rogue via the popular Rogue River Trail. However, these visitors have the opportunity to leave the trail for a spot in a raft. Thus, a river running permit is required for each hiker.

Assumption 1: we assume the number of boaters that floated on the Wild Rogue in 2007 after the permit season ended is equal to the number of boaters that floated on the same section in 2006 after the season ended.

Assumption 2: we assume the distribution of commercial and non-commercial boaters during the off-season is the same as during the permitting season.

Therefore, based on Assumption 1, we estimate there were a total of 889 people who floated the Wild Rogue in 2007 outside of the permit season; based on Assumption 2, we estimate that 404 were on commercial guided trips and 485 were non-commercial boaters.

Calculating the Economic Impact of Recreation on the Wild Rogue and Hellgate Recreation Sections

Recreation on the Rogue River brings dollars into the Josephine County economy in two ways:

1. Through the direct cost of a commercial rafting or fishing trip; and
2. Through the visitors' spending on food, lodging, transportation, and miscellaneous sales.

Outfitters, hotels, and other business that receive dollars directly from visitors spend some of those dollars on employee salaries and goods and services at other local businesses. The employees and other local businesses in turn do the same. This is referred to as the multiplier effect. Of course, from the beginning, some money spent on a Rogue River trip either does not come into the Josephine County economy or quickly passes out of the economy without providing much impact. The IMPLAN analysis accounts for this phenomenon. For example, we know that many outfitters are located outside Josephine County and many are located outside southwestern Oregon. Much of the spending on a Rogue River trip, therefore, does not enter into the Josephine County economy because the outfitter, office staff, and all or some of the guides do not live in the county. Likewise, these outfitters may purchase supplies for their trips in Jackson County or elsewhere in Oregon or California.

For this analysis, we assume that 42% of direct spending on Wild Rogue trips and 100% of Hellgate-Recreation trips are paid to outfitters located in Josephine County.[10] For the analysis, we assume that the typical weighted average Wild-Rogue trip costs $896. To arrive to these estimates, we used three sources of data:

---

[10] The 42% is based on the volume of guests that outfitters located in Josephine County guided down the Wild Rogue in 2007 (as a percentage of all commercially guided guests). It also includes a small portion of the revenue received by outfitters located outside of Josephine County, but which maintain a satellite office or warehouse in the county.

1. Published prices on outfitter websites for rafting and fishing trips of various length trips (in days) and various nightly accommodations (camp, lodge, camp/lodge).[11]

2. BLM data on the number of guests each outfitter guided down the Wild Rogue during in 2007[12]

3. Information from the outfitter interviews regarding the proportion of trips that were 2, 3, 4, or 5 days long and the proportion of their trips that offered camp, lodge, or camp/lodge for overnight stays.

Josephine County Impacts

Based on the estimate of the average price paid for a Wild-Rogue trip and the information from the BLM on the number of persons that floated on the two sections of the Rogue, we estimate that the total direct spending on commercial float trips on the Wild Rogue was $7,772,934. Of this total, we estimate $3,264,632 flowed directly into Josephine County. For the Hellgate Recreation section, we rely on the BLM's count of gross receipts paid to outfitters, which is $445,773. We assume all spending for commercial trips on the Hellgate Recreation section flowed directly into the Josephine County economy.

Dollars also flow into Josephine County through the purchase of food, lodging, transportation services, and miscellaneous sales by visitors on commercially guided trips and visitors that choose to do the trip on their own. To estimate spending patterns of non-commercial river runners, we contacted the BLM to obtain the names and addresses of all non-commercial trip leaders during the 2007 season. Our intention was to send each trip leader a short survey asking them about their spending patterns. This is the method followed by Hjerpe and Kim (2007) in their analysis of the economic impacts associated with river runners on the Grand Canyon. However, the BLM refused to provide this information to us following our Freedom of Information Act request.[13] Our request is currently under appeal.[14] As an alternative approach, we examined the

---

The 100% local for Hellgate Recreation guests is based on the outfitter interviews, which revealed that practically no commercially guided trips on the Hellgate Recreation section were conducted by outfitters outside of Josephine County.

[11] Note: Fishing trips are much more expensive than rafting trips due to the guide-guest ratio associated with drift boats. This results in a weighted average price of per trip that is considerably higher than most rafting trips.

[12] The BLM was not able to provide the number of guests by outfitter that floated the Hellgate Recreation section. However, they did provide the total number of commercial guided river runners and the total revenue earned by outfitters from these trips.

[13] The BLM and the National Park Service which provide Hjerpe and Kim (2007) with their data are both within the Department of the Interior.

[14] In August 2008 ECONorthwest received a letter from the BLM office in Washington DC informing us that they are backlogged with FOIA request and , though they are under legal obligation to consider our appeal within 40 days of submission, they would be unable to meet this

spending patterns presented in the published literature and developed three alternative assumptions, which yielded values ranging from $79 per person to $293 per person for commercial visitors and $94 to $391 per person for non-commercial.

Table 2: Estimated Spending by River Runners in Josephine County, 2007[15]

Sector	Commercial River Runners (6,381 non-local)		Non-Commercial River Runners (5,971 non-local; 842 local)*	
	Spending Per Person	Total Spending	Spending Per Person	Total Spending
Lodging (Hotels)	$42.69	$272,415	$35.82	$225,050
Lodging (RV parks, camps)	$10.67	$68,104	$8.96	$56,262
Gasoline/Auto	$3.57	$22,806	$3.00	$18,840
Eating and drinking	$63.24	$403,569	$53.07	$333,400
Food stores	$25.51	$162,769	$21.40	$134,468
Misc Retail	$24.67	$157,403	$48.10	$302,184
Total	**$170**	**$1,087,065**	**$170**	**$1,070,205**

Source: Analysis by ECONorthwest of data from BLM, Whisman et al (No date), and IMPLAN

*We assume 22% of non-commercial river runners are local, that only half of them would have substituted a trip outside the region, and that they spent 37% the amount of a non-local

We settled on the mid-range estimate of $170 per person for both commercial and non-commercial river runners (see Table 2), based on Whisman et al. (No date).[16] The distribution of spending among the various industry sectors differs for commercial and non-commercial river runners and is based on the results from the Johnson and Moore (1993) analysis of river runners on the Klamath River.

Whereas nearly all commercial river runners come from outside of Josephine County, many non-commercial river runners live in or near Josephine County and so their spending patterns related to a Wild Rogue trip will differ substantially from those who come from outside the county. To begin, we rely on the results of the Johnson and Moore (1993) analysis of river runners on the

---

obligation. As of January 2009, the BLM has still not notified ECONorthwest as to whether our FOIA appeal had been processed.

[15] Differences between commercial and non-commercial river runners in spending per sector are based on Johnson and Moore (1993).

[16] While the ideal scenario is a survey of the local river, the literature does provide reasonable estimates of spending, which can be thought of as lower and upper bounds on spending.

Klamath River (also in southwestern Oregon). The authors found that 22% of rafters were from the local area. They also found that half the local rafters would have substituted a trip on another river, had the Klamath River not been available. In other words, but for the Klamath River, their spending related to a river running trip would have left the local area. Finally, Johnson and Moore (1993) found that the average expenditures of local boaters represent 37% of the spending of non-locals boaters. We assume these proportions hold for non-commercial river runners on the Wild Rogue.

Summing up the spending estimates for commercial and non-commercial river runners in 2007, we believe total spending on the Wild Rogue that flowed directly into Josephine County to be $5,665,628.[17]

We followed a similar process to develop estimates of spending by commercial and non-commercial river runners on the Hellgate Recreation section. The Hellgate Recreation section does not have the Wild Rogue's reputation for wilderness. However, its greater accessibility makes it a popular destination for many commercial and non-commercial river runners. Summing up the spending estimates for commercial and non-commercial river runners, we estimate total spending on the Hellgate Recreation section in 2007 to be:

Spending on Outfitters:	$445,773
Visitor Spending by Commercial Guests:	$356,017
Visitor Spending by Non-Commercial Guests:	$593,212
Total Spending by River Runners on Hellgate Recreation	$1,395,002

The estimates of spending within Josephine County by river runners visiting the Wild Rogue and Hellgate Recreation sections are used as inputs to the IMPLAN model to calculate three measures of economic activity within Josephine County:

1. Total direct, indirect, and induced economic output
2. Total direct, indirect, and induced income
3. Total direct, indirect, and induced jobs supported.

We estimate that whitewater rafting and fishing on the Wild Rogue generated $7.7 million in total economic output in Josephine County and 140 full- and part-time jobs in 2007 (see Table 3).[18] From total output, $3.6 million was paid as business income and wages. Approximately one-third of total output and income was associated with indirect and induced effects (i.e., spending by other business

---

[17]

Spending on Outfitters:	$3,264,632
Visitor Spending by Commercial Guests:	$1,087,065
Visitor Spending by Non-Commercial Guests:	$1,313,930
Total Spending by River Runners on Wild Rogue:	$5,665,628

[18] The IMPLAN modeling system provides estimates of "jobs," rather than an estimate of full-time equivalent jobs.

to support the directly affected businesses and spending by employees and business owners).

Table 3: Economic Impacts in Josephine County Associated with Recreation on the Wild Section of the Rogue River, 2007*

Type of Impact	Direct	Indirect	Induced	Total Impact
Output	$5,071,600	$1,317,560	$1,298,360	$7,687,520
Income**	$2,252,220	$593,190	$748,240	$3,593,650
Jobs	109	14	17	140

Source: ECONorthwest analysis of BLM and outfitter survey data

*Commercial and non-commercial impacts combined. See Appendix A for breakout

** Income is a subset of Output and includes both employee wages and business income

Table 4 shows the economic impact on Josephine County associated with recreation on the Hellgate Recreation section. In addition to commercial and non-commercial rafting and fishing, the Recreation section can be experienced by commercial jetboat. Based on BLM data, there were 4,493 commercial boaters, at least 25,000 non-commercial users,[19] and 84,840 guests of commercial jetboats on the Hellgate Recreation section in 2007. Estimates of the proportion of rafters and anglers that are local and non-local and the proportion of visitors that would have substituted another local site if the Hellgate Recreation section was not available are based on Johnson and Moore (1993). Accounting for differences in spending patterns between locals and non-locals as well as substitution of other sites is necessary so as to not overstate the economic impact of river users.

[19] Non-commercial use on the Hellgate Recreation section includes rafting, fishing (both boat and bank), picnicking, sightseeing, and recreational placer mining. Estimates of non-commercial use on the Hellgate Recreation section are based on BLM float survey data for 2007. In 1994, the last year for which we were able to obtain a detailed report from the BLM, 24% of recreationalists on the Hellgate Recreation section (including rafters, float anglers, bank anglers, and guest on commercial jet boats), or 25, 562 people were non-commercial users. We conservatively assume that this number has not increased.

Table 4: Economic Impacts in Josephine County Associated with Recreation on the Hellgate Recreation Section of the Rogue River, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Rafting and Fishing on Hellgate Recreational Section				
Output	$2,139,920	$525,390	$576,260	$3,241,570
Income*	$966,110	$235,050	$332,090	$1,533,250
Jobs	45	5	8	58
Jetboat Tours				
Output	$3,315,530	$342,920	$1,660,490	$5,318,940
Income*	$2,382,490	$172,170	$894,030	$3,448,690
Jobs	33	3	22	59

Source: ECONorthwest analysis of BLM and outfitter survey data

* Income is a subset of Output and includes both employee wages and business income

River recreation on the Hellgate Recreation section was responsible for nearly $8.6 million in total economic output, almost $5 million in income, and more than 100 full- and part-time jobs in Josephine County in 2007.

Total Economic Impacts of Recreation on the Wild Rogue & Hellgate Recreation Sections to Josephine County in 2007

Considering both the Wild Rogue and Hellgate Recreation sections we find that river-based recreation generated more than $16 million in economic impact in Josephine County in 2007. Of this total, approximately $8.4 million was paid in wages and business income and approximately 250 full- and part-time jobs were supported. Table 5 summarizes these results.

Table 5: Total Economic Impacts in Josephine County Associated with Recreation on the Wild and Hellgate Recreation Sections of the Rogue River, 2007*

River Section	Direct Spending	Total Economic Output	Income
Wild Rogue	$5,665,628	$7,687,520	$3,417,750
Hellgate Recreation	$6,054,690	$8,560,510	$4,981,940
Total Wild and Recreation Sections	$11,720,318	$16,248,030	$8,399,690

Source: ECONorthwest analysis of BLM and outfitter survey data

* Please see Appendix A for a detailed breakdown by river section

Statewide Impacts

Statewide economic impacts were estimated following the same procedures outlined for the county-level estimates, though several of the underlying assumptions are different for the statewide analysis. The most important assumption difference is the inclusion of all Wild Rogue commercial outfitters located within the state. Recall that only the direct spending on commercial Wild Rogue trips provided by outfitters physically located in Josephine County were included in the county-level analysis (42% in 2007). For the statewide analysis, we include all Wild Rogue trips led by a commercial outfitters physically located anywhere in the state of Oregon—about 91% of trips in 2007. The other assumption differences pertain to spending patterns of visitors and the availability of substitute sites. [20]

Based on the estimate of the average price paid for a Wild-Rogue trip and the information from the BLM on the number of persons that floated on the two sections of the Rogue, we estimate that the total direct spending on commercial float trips on the Wild Rogue was $7,772,934. Of this total, we estimate $7,073,370 flowed to outfitters located in Oregon. For the Hellgate Recreation section, we assume no additional statewide spending beyond the $445,773 paid to Josephine County outfitters. Statewide estimates of per visitor and total spending are shown Appendix B.

Summing up the estimates of travel spending and direct spending on outfitters, we believe total statewide spending by visitors to the Wild Rogue and Hellgate Recreation section in 2007 to be $18.6 million. As in the countywide analysis, the estimates of statewide visitor spending are used as inputs to the IMPLAN model, to calculate measures of statewide economic impacts.

We estimate that whitewater rafting, fishing, and hiking on the Wild Rogue generated $18.1 million in total economic activity and supported nearly 300 full- and part-time jobs in Oregon in 2007 (see Table 6). $8.8 million in income was paid out to employees or earned by business owners (nearly $30,000 per job supported).

---

[20] We include estimates of all spending within the state to access the Wild Rogue or Hellgate Recreation section. However, we acknowledge greater substitution opportunities associated with the statewide perspective. The result is a slightly higher total visitor spending. Because of the unique qualities of the Wild Rogue (e.g., aesthetic beauty, summer water flows, appealing climate), we assume that any substitutable site is outside the State of Oregon.

Table 6: Economic Impacts in Oregon Associated with Recreation on the Wild Section of the Rogue River, 2007*

Type of Impact	Direct	Indirect	Induced	Total Impact
Output	$10,005,830	$3,933,560	$4,166,630	$18,106,020
Income**	$4,532,380	$1,880,740	$2,356,920	$8,770,040
Jobs	217	35	46	298

Source: ECONorthwest analysis of BLM and outfitter survey data

*Commercial and non-commercial impacts combined. See Appendix A for breakout

** Income is a subset of Output and includes both employee wages and business income

Table 7 shows the economic impacts in Oregon associated with recreation on the Hellgate Recreation section. The data are broken down so that the economic impacts of jetboat tours can be viewed separately from the economic impacts of rafting and fishing.

Table 7: Economic Impacts in Oregon Associated with Recreation on the Hellgate Recreation Section of the Rogue River, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Rafting and Fishing on Hellgate Recreational Section				
Output	$2,495,410	$1,030,270	$1,066,020	$4,591,700
Income*	$1,233,360	$473,760	$601,810	$2,308,930
Jobs	51	8	12	71
Jetboat Tours				
Output	$3,787,010	$721,640	$2,513,140	$7,021,790
Income*	$2,593,930	$363,090	$1,401,850	$4,358,870
Jobs	41	6	28	74

Source: ECONorthwest analysis of BLM and outfitter survey data

* Income is a subset of Output and includes both employee wages and business income

River recreation on the Hellgate Recreation section was responsible for approximately $11.6 million in total economic output, over $6.6 million in income, and 145 full- and part-time jobs in Oregon State in 2007.

Total Economic Impacts of Recreation on the Wild Rogue & Hellgate Recreation Sections to Oregon State in 2007

Considering both the Wild Rogue and Hellgate Recreation sections we find that river-based recreation generated nearly $30 million in economic impact in Oregon in 2007. Of this total, approximately $15.4 million was paid in wages and business income and 445 full- and part-time jobs were supported (see Table 8). For more detailed results by river section and recreational activity, please see Appendix B.

Table 8: Total Economic Impacts in Oregon Associated with Recreation on the Wild and Hellgate Recreation Sections of the Rogue River, 2007*

River Section	Direct Spending	Total Economic Output	Income
Wild Rogue	$11,644,978	$18,106,020	$8,770,040
Hellgate Recreation	$6,935,565	$11,613,490	$6,667,800
Total Wild and Recreation Sections	$18,580,543	$29,719,510	$15,437,840

Source: ECONorthwest analysis of BLM and outfitter survey data

* Please see Appendix A for a detailed breakdown by river section

DISCUSSION

The tourism and recreation industries have grown in Josephine County in the last couple of decades, with the rate of employment in the leisure and hospitality sectors exceeding the growth rate of the overall employment in the county by 5% between 2001 and 2006. The goods and services that the Wild & Scenic Rogue River offers represent a gateway that opens Josephine County up to tourists who come to recreate on the river and to people who decide to relocate in the county to have faster access to the river amenities. The two surveys of the local businesses, outfitters and lodging that ECONorthwest conducted show that the strength of the connection between the Wild & Scenic Rogue and Josephine County is indisputable, with the river playing an essential part in the cultural identity of the county residents.

Our analysis presents evidence that whitewater recreational activities associated with the Wild & Scenic Rogue contribute substantially to the economy of Josephine County and to the statewide economy as a whole and account for part of the growth, both in demographic and economic terms. The input-output model we use estimates that in 2007 whitewater recreational activities on the Hellgate Recreation and the Wild sections of the Rogue contributed $14 million in total economic output, including $7.4 million in personal income, and 225 full- and part-time jobs for Josephine County alone. We calculate that statewide impacts generated from whitewater recreational activities on these sections of the Rogue in 2007 account for nearly $30 million in economic output, including $15.4 million in personal income, and 445 million full- and part-time jobs. Assumptions and caveats imbedded in our analysis may under- or overestimate the magnitude of these results. Despite such shortcomings, our study demonstrates that these types of recreation activities related to the Wild & Scenic Rogue River are significant factors that account for a considerable amount of growth in Josephine County and in the entire state of Oregon.

BIBLIOGRAPHY

Cordell, H.K., J.C. Bergstrom, G.A. Ashley, and J. Karish. 1990. "Economics Effects of River Recreation on Local Economies." *Water Resources Bulletin* 26: 53-60.

Economic Strategies Northwest. 1994. *Economic Effects Study: Hellgate Recreation Area Management Plan, Summary Report.* Bureau of Land Management, Medford District, Oregon.

English, D.K. and J.M. Bowker. 1996. "Economic Impacts of Guided Whitewater Rafting: A Study of Five Rivers." *Water Resources Bulletin* 32: 1319-1328.

Hjerpe, E.E. and Y-S. Kim. 2007. "Regional Economic Impacts of Grand Canyon River Runners." *Journal of Environmental Management* 85: 137-149.

Johnson, R.L. and E. Moore. 1993. "Tourism Impact Estimation." *Annals of Tourism Research* 20: 279-288.

Kerkvliet, J, A.J. Plantinga, H. Eichman, and G.L. Hunt. 2008. "Did the Northwest Forest Plan Impact Rural Counties More Than Urban Counties?" Retrieved July 15, 2008, from http://www.cof.orst.edu/cof/fr/facultypages/rosenberger/W1133%20Proceedings/Interim_Report_20%20(2007)/IR20_12.pdf.

McGranahan, D.A. 1999. *Natural Amenities Drive Rural Population Change.* Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 781. September.

Palazzi, D. 1986. *The Economic Importance of Boating Recreation in Oregon: An Analysis and Recommendation for the Oregon State Marine Board.* Oregon State University. December.

Partridge, M.D. and D.S. Rickman. 2003. "The Waxing and Waning of Regional Economies: The Chicken—Egg Question of Jobs Versus People." *Journal of Urban Economics* 53: 76-97.

Rasker, R. 2006. "An Exploration into the Economic Impact of Industrial Development Versus Conservation on Western Public Lands." *Society and Natural Resources* 19: 191-207.

Reeder, R.J. and D.M. Brown. 2006. *Recreation, Tourism, and Rural Well-Being.* Economic Research Service, U.S. Department of Agriculture. Economic Research Report Number 7. August.

Oregon Employment Department, Oregon Labor Market Information System (OLMIS). No date. *Josephine County.* Retrieved July 21, 2008, from http://www.qualityinfo.org/olmisj/OlmisZine

Tauer, G. 2006. *Josephine County Manufacturing – All Eggs No Longer in Wood Products Basket.* Oregon Employment Department. July 27. Retrieved July 21, 2008, from http://www.qualityinfo.org/olmisj/ArticleReader?itemid=00005021

United States Congress. House. 1968a. Report No. 1623. Providing for a National Scenic Rivers System and for Other Purposes. 90th Congress. 2d Session.

U.S. Department of the Interior, Bureau of Land Management and U.S. Department of Agriculture, Forest Service (BLM and Forest Service). 2004. *Rogue River Float Guide.* Retrieved July 31, 2008, from http://www.blm.gov/or/resources/recreation/rogue/files/FloatGuide04.pdf

U.S. Department of the Interior, Bureau of Land Management (BLM). 2008. *2007 Wild Rogue River Use Report: Grave Creek to Foster Bar, May 15 – October 15.*

U.S. Department of the Interior, Bureau of Land Management (BLM). No date. *The Rogue National Wild and Scenic River: Rogue River Wild Section.* Retrieved July 18, 2008, from http://www.blm.gov/or/resources/recreation/rogue/Wild-rogue-river-stretch.php

Whisman, S.A, S.J. Hollenhorst, and C.D. Jones. No date. "A Summary of Economic Impacts of Commercial Whitewater Rafting in West Virginia." West Virginia Division of Natural Resources. Retrieved July 15, 2008, from http://www.aceraft.com/mediapg/medapg27.html

APPENDIX A: DETAILED RESULTS OF ECONOMIC IMPACT ANALYSIS FOR JOSEPHINE COUNTY

Table 9: Economic Impacts of Recreation on the Wild Section of the Rogue River on Josephine County, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Commercial Rafting, Fishing, and Hiking				
Output	$4,127,950	$1,095,000	$1,036,300	$6,259,250
Income	$1,820,460	$493,620	$596,850	$2,910,930
Business Inc.	$750,940	$246,710	$176,250	$1,173,900
Wages	$1,069,520	$246,910	$420,600	$1,737,030
Jobs	89.4	11.8	13.9	115.1
Non-Commercial Rafting, Fishing, and Hiking				
Output	$943,650	$222,560	$262,060	$1,428,270
Income	$431,760	$99,570	$151,390	$682,720
Business Inc.	$159,240	$49,970	$44,480	$253,690
Wages	$272,520	$49,600	$106,910	$429,030
Jobs	19.5	2.3	3.5	25.3

Source: ECONorthwest analysis of BLM and outfitter survey data

Table 10: Economic Impacts of Recreation on the Hellgate Recreation Section of the Rogue River on Josephine County, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Commercial Rafting and Fishing on Recreational Section				
Output	$728,510	$189,140	$185,910	$1,103,560
Income	$323,370	$84,960	$107,020	$515,350
Wages	$129,990	$42,570	$31,640	$204,200
Business Inc.	$193,380	$42,390	$75,380	$311,150
Jobs	15.5	2	2.5	20
Non-Commercial Rafting and Fishing on Recreation Section				
Output	$1,411,410	$336,250	$390,350	$2,138,010
Income	$642,740	$150,090	$225,070	$1,017,900
Business Inc.	$236,640	$75,500	$66,340	$378,480
Wages	$406,100	$74,590	$158,730	$639,420
Jobs	29.7	3.4	5.2	38.3
Jetboat Tours				
Output	$3,315,530	$342,920	$1,660,490	$5,318,940
Income	$2,382,490	$172,170	$894,030	$3,448,690
Business Inc.	$1,390,580	$84,070	$241,380	$1,716,030
Wages	$991,910	$88,100	$652,650	$1,732,660
Jobs	33	3	22	59

Source: ECONorthwest analysis of BLM and outfitter survey data

Table 11: Economic Impacts of Recreation on the Two Sections of the Rogue River on Josephine County, 2007

River Section	Activity	Direct Spending	Total Economic Output	Income (1)
Wild Section	Commercial Rafting & Fishing	$4,351,698	$6,259,250	$2,910,930
	Non-Comm. Rafting, Fishing, & Hiking	$1,313,930	$1,428,270	$506,820
	Total	$5,665,628	$7,687,520	$3,417,750
Recreation Section	Commercial Rafting & Fishing	$801,790	$1,103,560	$515,350
	Non-Comm. Rafting & Fishing	$1,937,376	$2,138,010	$1,017,900
	Jetboat Tours	$3,315,524	$5,318,940	$3,448,690
	Total	$6,054, 690	$8,560,510	$4,981,940
Total Wild and Recreation Sections		**$11,720,318**	**$16,248,030**	**$8,399,690**

Source: ECONorthwest analysis of BLM and outfitter survey data

(1) Includes personal and business income

APPENDIX B: DETAILED RESULTS OF ECONOMIC IMPACT ANALYSIS FOR OREGON

Table 12: Estimated Statewide Spending by Visitors to the Wild & Scenic Rogue River, 2007[21]

Sector	Commercial River Runners (6,381 non-local)		Non-Commercial River Runners (5,971 non-local; 842 local)*	
	Spending Per Person	Total Spending	Spending Per Person	Total Spending
Lodging (Hotels)	$21	$135,883	$21	$133,775
Lodging (RV parks, camp)**	$0	$0	$0	$0
Gasoline/Auto	$31	$198,316	$31	$195,240
Eating and drinking	$89	$568,137	$89	$559,326
Food stores	$38	$243,487	$38	$239,711
Misc Retail	$113	$723,484	$212	$1,330,523
Total	$293	$1,869,308	$391	$2,458,575

Source: Analysis by ECONorthwest of data from BLM, Hjerpe & Kim (2007), and IMPLAN

*We assume 22% of non-commercial river runners are local, that only half of them would have substituted a trip outside the region, and that they spent 37% the amount of a non-local

*** Spending per person based on Hjerpe & Kim (2007). The authors do not break out RV park and camp lodging from hotel and other lodging.

[21] Differences between commercial and non-commercial river runners in spending per sector are based on Johnson and Moore (1993).

Table 13: Economic Impacts of Recreation on the Wild Section of the Rogue River on Josephine County, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Commercial Rafting, Fishing, and Hiking				
Output	$8,332,110	$3,243,140	$3,419,900	$14,995,150
Income	$3,704,780	$1,573,080	$1,931,890	$7,209,750
Business Inc.	$1,515,980	$697,020	$563,770	$2,776,770
Wages	$2,259,580	$900,140	$1,389,060	$4,548,780
Jobs	181	30	38	249
Non-Commercial Rafting, Fishing, and Hiking				
Output	$1,673,720	$690,420	$746,730	$3,110,870
Income	$827,600	$307,660	$425,030	$1,560,290
Business Inc.	$274,990	$139,570	$122,520	$537,080
Wages	$662,010	$199,540	$330,940	$1,192,490
Jobs	35.8	5.1	8.3	49.2

Source: ECONorthwest analysis of BLM and outfitter survey data

Table 14: Economic Impacts in Oregon of Recreation on the Hellgate Recreation Section of the Rogue River on Josephine County, 2007

Type of Impact	Direct	Indirect	Induced	Total Impact
Commercial Rafting & Fishing on Recreational Section				
Output	$1,062,220	$433,370	$443,370	$1,938,960
Income	$505,000	$202,520	$250,010	$957,530
Wages	$285,850	$102,970	$134,390	$523,210
Business Inc.	$219,150	$99,550	$115,620	$434,320
Jobs	21.8	3.6	4.9	30.3
Non-Commercial Rafting & Fishing on Recreational Section				
Output	$1,433,190	$596,900	$622,650	$2,652,740
Income	$728,360	$271,240	$351,800	$1,351,400
Wages	$478,970	$151,280	$249,160	$879,410
Business Inc.	$249,390	$119,960	$102,640	$471,990
Jobs	29.4	4.6	6.9	40.9
Jetboat Tours				
Output	$3,787,010	$721,640	$2,513,140	$7,021,790
Income	$2,593,930	$363,090	$1,401,850	$4,358,870
Wages	$1,466,080	$158,570	$417,740	$2,042,390
Business Inc.	$1,150,880	$214,720	$991,470	$2,357,070
Jobs	41	6	28	74

Source: ECONorthwest analysis of BLM and outfitter survey data

Table 15: Statewide Economic Impacts of Recreation on the Hellgate and Wild Rogue Sections of the Rogue River, 2007

River Section	Activity	Direct Spending	Total Economic Output	Income (1)
Wild Section	Commercial Rafting & Fishing	$8,942,678	$14,995,150	$7,209,750
	Non-Commercial Rafting & Fishing	$2,702,300	$3,110,870	$1,560,290
	Total	$11,644,978	$18,106,020	$8,770,040
Recreation Section	Commercial Rafting & Fishing	$1,211,179	$1,938,960	$957,530
	Non-Commercial Rafting & Fishing	$1,937,376	$2,652,740	$1,351,400
	Jetboat Tours	$3,787,010	$7,021,790	$4,358,870
	Total	$6,935,565	$11,613,490	$6,667,800
Total Wild and Recreation Sections		$18,580,543	$29,719,510	$15,437,840

Source: ECONorthwest analysis of BLM and outfitter survey data

(1) Includes personal and business income

Appendix C: Potential Limitations of Economic-Impact Analysis

While the IMPLAN modeling framework is quite sophisticated in both construction and specification, its results are constrained by limitations of which the policy analyst or decision-maker has to be aware. One of the main shortcomings of the IMPLAN model is that it is static, presenting one snapshot in time, and so it fails to account for the adjustments the economy will make to respond to different stimuli.

Another limitation of the model is that it assumes that production relationships are constant and don't adjust and that businesses will use the same bundle of inputs even when their prices change. Thus, the IMPLAN model does not recognize substitution within the production process.

Additionally, the model assumes that supplies of inputs to production are not limited. Under an assumption of no supply constraints, an outfitter simply responds to a change in final demand by increasing the number of trips. This is not a realistic assumption for the Wild section, where the number of visitors is limited by the number of available permits. For the Recreation section, this assumption is also unreasonable: the river would get so crowded that rafters would choose to go elsewhere.

Furthermore, the IMPLAN model does not account for social costs imposed by the influx of non-local recreationalists. As Hjerpe and Kim (2007) noted in their study, tourism brings with it increased congestion, crime, and environmental degradation, through Wildlife disturbance, pollution, and erosion. Again, the IMPLAN model does not have the tools to capture these costs.

This is not to say that employing the IMPLAN model is without merit. We are simply stating that, when interpreting the results of the model, one must take into account all the assumptions that are imbedded in them to get a more accurate understanding of the mechanisms that fuel that particular industry and of its contributions to the regional economy.

LUCKY
MINERALS

August 7, 2017

202-905 W. Broadway St.
Vancouver, BC V5Z 4M3
T: 866.924.6484
C: 310.435.0435
robert@luckyminerals.com

Re: SENATE BILL 941 (S.941)

Dear Honored Members of the Senate Public Lands, Forests and Mining Subcommittee:

Lucky Minerals Montana, Emigrant Creek Project (LM) submits the following in opposition to Senate Bill 941(S.941) wherein the U.S. Department of the Interior would be tasked to permanently segregate and withdraw mineral exploration and mining of approximately 30,000 acres of U.S. Forest Service land in Southwestern Montana, North of Yellowstone National Park.

Mining has consistently played a critical role in America's economy. A secure domestic source of minerals and metals are important not only to our local and state economies, but to the national defense and infrastructure of the United States. As such, Lucky Minerals vehemently opposes the intent of S. 941.

The Project

Lucky Minerals is an explorative mining company targeting a large-scale porphyry copper-gold-molybdenum system in southern Montana that could potentially host a multi-million ounce Copper-Gold-Silver Molybdenum deposit The company is focused on its Emigrant Creek Project, which covers a 6 square mile area (15-square kilometer) located in the core of the mineralized and intensely altered Historic Emigrant Mining District. LM is managed by a company in the Pacific Northwest with over 200 years of combined experience in the field.

The Emigrant Mining District has historically been the site of small-scale lode and placer operations since the 1860s and 1870s. During that period, an estimated 40,000 ounces of gold were produced predominantly from placer operations. Beginning in the early 1970s, a series of companies conducted various types of mineral exploration within the Emigrant District. The most recent phase of modern exploration started in 1990 when Kennecott drilled six helicopter supported core holes on the south flank of DUV Ridge. All of these holes intersected anomalous to ore grade gold and copper mineralization.

To date, ten highly mineralized breccia-pipes and two porphyry targets exist within LM's property boundary. These targets have been variously explored by historical drilling, induced polarization geophysical surveys, rock chip sampling and geologic and alteration mapping. LM's properties are comprised of nine patented claims and eight unpatented claims, with an additional 117 claims staked, covering a total area of approximately 2,560 acres.

The Bureau of Mines (see MLA 19-93 Mineral Resource Appraisal of the Gallatin National Forest) and the USGS (North Absoroka Study Area, Montana, USGS Bulletin 1505) recognized the significant potential of the Emigrant Mining District for strategic mineral and metallurgic resources. As such, it was found in the best interests of the United States to exclude this area from a wilderness designation and leave it open to exploration.

Economic Impact

The mining industry is critical to not only Montana, but the United States as a whole. Montana ranks 8th in gold production among the Western United States. Additionally, mining stands as the 6th largest employer in the state, creating nearly 10,000 direct employment opportunities and approximately 20,000 indirect. The impacts of such on Montana's annual economy stands at an estimated $3.5-$5.1 billion.

The United States is home to a projected $6.2 trillion in minerals and metals reserves, but this advantage is compromised when companies face delays in exploration, development, and opening of new mining operations. Such delays affect any efforts to rebuild domestic infrastructure, which is in direct contradiction to President Trump's infrastructure initiatives. Without timely access to

these resources, the United States places its national security at risk by continued growing dependence on foreign entities to supply critical minerals needed in high-tech and industrial manufacturing.

A land withdrawal of this magnitude will impede LM's ability to assess the strategic resource, its subsequent value, attract investors, and potentially harm local and state economies. As an example, the Stillwater Mine nearby, contributes an estimated $1 billion yearly to Montana's economy. LM respectfully requests that the Committee address the cumulative effect this withdrawal will have on the mining industry as a whole. This large scale, unnecessary withdrawal will set a dangerous precedent triggering other withdrawals on federal lands. Where will it stop?

According to the 2017 USGS Mineral Commodities Summary, in 2016, imports made up more than one-half of the U.S. consumption of 50 nonfuel mineral commodities. The United States was 100 percent import reliant for 20 nonfuel mineral commodities and 50 percent import reliant for an additional 31. With half of the nation's mineral wealth already off-limits or under restrictions, further limitations and land withdrawals will undoubtedly increase America's import reliance with the end result of destabilizing our Nation's infrastructure. Protecting environmentally sustainable domestic sources of strategic and critical minerals for potential efficient development is critically important to national security and domestic growth.

Senator Tester's Testimony

Senator Tester, in his testimony before this body, asserted that the Lucky Minerals Project could result in a Superfund site similar in scale to the Berkeley Pit Superfund site located in Butte, Montana. This broad generalization is misleading at best. Senator Tester fails to take into account industry wide standard reforms at both the state and federal level; as well as corporate responsibility. Modern day mining is significantly different from mining in our grandfather's era. Before the 1990's, mining was purely for profit with little regard to land recovery. Since that time, hardrock miners have effectively integrated public partnership, environmental sustainability, transparency, and reclamation as standard practice.

In fact, federal and state regulation of hardrock mining has successfully averted any permitted hardrock mine from being placed on the Environmental Protection Agencies (EPA) National Priorities List of environmental cleanup sites in the last 27 years. In other words, there has never been a permitted hardrock mine in the West that the EPA has designated as a superfund national priority after 1990.

LM is resolute in its commitment to being a good steward of the land, forming collaborative partnerships with in the communities in which they work, being transparent and adhering to all state and federal permitting regulations. The already stringent permitting processes in place should ultimately determine the viability of a project, not last minute withdrawals by an outgoing Administration.

Finally, in Senator Tester's testimony before this body, he characterized the Emigrant Mining District as being located at the headwaters of the Yellowstone River. These statements are wholly inaccurate.

The headwaters of the Yellowstone River are outside the southeast park boundary on Younts Peak (Wyoming) and flow into Yellowstone Lake. It leaves the lake at Fishing Bridge, and continues north-northwest until it leaves the park near Gardiner, Montana. The Yellowstone River continues north and east through Montana and joins the Missouri River just across the North Dakota state line.

It is a common tactic of anti-development mining groups to leverage messages regarding water sources to fundraise and propagate anti-mining sentiment. At this time, LM and the Montana Department of Environmental Quality (DEQ) agree that there will be insignificant impacts to the water in the area and permits have been issued for drilling on LM's private land in accordance with a stringent review process. In fact, the DEQ has publicly stated that LM has established efforts mitigating beyond what they are required by statute. Additionally, some of the studies that will be conducted during the exploration process will produce more data on water quality which may lead LM to initiate further protections as needed.

Conclusion

We know that you understand the critical role mining plays in America's economy as it is the beginning of the supply chain for manufacturing and industry. A secure domestic source of minerals and metals are important to high paying job creation, national defense and economic growth. Congress has continually recognized that federal public lands in the West are an important source of strategic and critical minerals when, in enacting the Federal Land Policy and Management Act, it declared that "the public lands be

managed in a manner which recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public lands including implementation of the Mining and Minerals Policy Act of 1970 as it pertains to the public lands." Fulfilling this mandate requires reasonable access and security of tenure.

We commend your commitment to utilizing American resources and ensuring that the U.S. remains globally competitive. We would welcome the opportunity to have further discussion on the matter and what steps may be implemented to position the United States as a leader in strategic minerals and metals production. The United States can become independent of foreign strategic minerals and metals if we can find sustainable solutions that allow exploration like ours to operate lawfully without being impeded by a land withdrawal. As such, we respectfully request your opposition to S.941.

Regards,

Robert

Robert Rosner, President/CEO
Lucky Minerals Inc.
905 West Broadway, Suite 202
Vancouver, BC V5Z 4M3
T: (866) 924-6484
C: (310) 435-0435

Protecting Montana's wildlife, land, waters and hunting & fishing heritage for future generations.

July 19, 2017

The Honorable Mike Lee
Chairman
Subcommittee on Public Lands, Forests, and Mining
Committee Energy and Natural Resources
US Senate
Washington, DC 20510

The Honorable Ron Wyden
Ranking Member
Subcommittee on Public Lands, Forests, and Mining
Committee Energy and Natural Resources
US Senate
Washington, DC 20510

Re: Yellowstone Gateway Protection Act (S. 941)

Dear Chairman Lee and Ranking Member Wyden:

The Montana Wildlife Federation (MWF) is Montana's oldest and largest sportsmen's conservation organization. Since 1936, we've led efforts to protect Montana's abundant fish and wildlife, our natural lands and waters, and public access for hunting, fishing, and other outdoor recreation. Our members include thousands of Montanans and people from across the nation who enjoy hunting, angling, wildlife watching and seek to Montana's lands, waters, and outdoor heritage for future generations.

Senator Jon Tester introduced the Yellowstone Gateway Protection Act (S. 941) after local residents and businesses asked Montana's congressional delegation to protect the region from large-scale mining operations. The bill would permanently withdraws federal mineral rights on 30,000 acres of public land in the Custer Gallatin National Forest adjacent to the Absaroka-Beartooth Wilderness and Yellowstone National Park. The bill eliminates the ability for proposed mines to expand onto unclaimed public land.

As you know, Yellowstone National Park is a place of state, regional, national, and international significance. More than four million people visited Yellowstone National Park last year. People come from around the world every year to the Greater Yellowstone ecosystem to experience the pristine land and water, and marvel at the abundance of fish and wildlife. These visitors spent an average of $196 million in Park County, Montana, in 2014. The Greater Yellowstone ecosystem sustains thousands of jobs in tourism, outdoor recreation, hunting, fishing, farming and ranching. Senator Tester's bill recognizes that a protected Yellowstone National Park and a clean Yellowstone River are worth more to Montanans than short-term mineral extraction.

The Montana Wildlife Federation recognizes that mining is an appropriate activity on some public lands. The doorstep of Yellowstone National Park and the headwaters of the Yellowstone River is not a place where mining is appropriate. The ecosystem's incredible public lands, agricultural heritage, clean rivers and pristine streams are the lifeblood of the local economy.

PO Box 1175 | Helena, Montana 59624 | t. 406.458.0227 | e. mwf@mtwf.org | montanawildlife.org

Sen. Tester's bill provides a simple and direct withdrawal of mineral rights and should be adopted as introduced. Congress has used virtually identical legislative language to prevent mineral development in other high priority landscapes that have strong local support, including the North Fork Watershed Protection Act of 2014 (Section 3063, Public Law 113-291). In addition, Senator Tester's bill specifically protects hunting, fishing, and other recreational uses within the withdrawal area.

The simple, clear language in S. 941 is the most effective way to accomplish the objective of protecting the Yellowstone landscape. There is no need to develop alternative legislation, and no guarantee that any other legislation will be as effective. We further urge you resist any efforts to bring unrelated issues into the bill, which could disrupt the strong bipartisan consensus behind this proposal.

Passage of the Yellowstone Gateway Protection Act will mean cold clear water for trout, anglers, boaters and, irrigation, elk and bighorn sheep for wildlife watchers and hunters, and economic activity for Montana communities. We urge you to approve this bill and work to secure its enactment.

Sincerely,

Dave Chadwick
Executive Director

Please Support S. 32 / California Desert Protection and Recreation Act

July 25, 2017

Dear Senator,

Since 1919, the National Parks Conservation Association (NPCA) has been the leading voice of the American people in protecting and enhancing our National Park System. On behalf of our more than 1.3 million members and supporters nationwide, I urge you to **support S. 32** when it is heard by the Energy and Natural Resources Subcommittee on Public Lands, Forests and Mining on July 26th.

The California desert is world renowned for its vast and scenic landscapes. It is home to five iconic national park sites (Death Valley National Park, Mojave National Preserve, Joshua Tree National Park, Castle Mountains National Monument, and Manzanar National Historic Site), two National Park Service-managed National Historic Trails (Juan Bautista De Anza and the Old Spanish Trail) and many famous Bureau of Land Management national monuments and wilderness areas. The California desert is home to a spectacular diversity of natural resources and geologic features including sand dunes, natural limestone cave systems, lava flows and lava tubes, rugged desert mountains, forests of Joshua trees and yucca, cactus gardens, multi-colored mountains, wild and scenic rivers, and stone arches and hoodoos.

S. 32 proposes a thoughtful balance of responsible land-use management and opportunities for recreation and conservation. The California desert has long drawn residents from urban areas, and increasingly, visitors from around the world come to enjoy the desert's open spaces, welcoming communities, and spectacular natural resources. Joshua Tree National Park alone recorded 2.5 million visitors in 2016, up from 2 million in 2015 making these public lands a significant economic engine for desert counties. In fact, Death Valley, Joshua Tree, and Mojave combined to contribute 266 million dollars to California desert economies and communities.

This legislation enjoys tremendous grassroots support from local communities of recreationists, businesses and industry, faith-based groups, local tribes, and chambers of commerce. NPCA has worked in partnership with these local communities, elected officials, and stakeholders on California desert legislation since 2009 and continues to urge Congress to act to preserve this iconic landscape. Please support S. 32 at tomorrow's hearing.

Thank you for considering our position. Please don't hesitate to contact me at akameenui@npca.org with any questions.

Sincerely,

Ani Kame'enui
Director, Legislation and Policy

777 6th Street, NW, Suite 700 | Washington, DC 20001-3723 | P 202.223.6722 | F 202.872.0960 | npca.org

Please Support S.941 / The Yellowstone Gateway Protection Act

July 25, 2017

Dear Senator:

Since 1919, the National Parks Conservation Association (NPCA) has been the leading voice of the American people in protecting and enhancing our National Park System. On behalf of our more than 1.3 million members and supporters nationwide, I urge you to **support S.941** when it is heard by the Energy and Natural Resources Subcommittee on Public Lands, Forests and Mining on July 26th.

The legislation would permanently withdraw federal mineral rights on approximately 30,000 acres of National Forest System lands adjacent to Yellowstone National Park. This landscape, including the nation's first National Park, is currently threatened by two proposed industrial-scale gold mines.

Industrial-scale operations, one potentially within view of the Roosevelt Arch that marks the northern entrance to Yellowstone, could have disastrous consequences on the environment, the local businesses that depend on the area's thriving tourist economy, and the park experience that draws millions of visitors from across the globe. These visitors come for the abundant wildlife, world class fishing, recreational opportunities, and scenic vistas. These public lands also play a vital role in the health of the wildlife and waters of our nation's first National Park and of the Greater Yellowstone Ecosystem.

The proximity of the proposed mines to the park would impair the park's air quality, night skies, and globally-unique geothermal resources, as well as the iconic grizzly bear and a long list of other valued wildlife. Additionally, the proposed mines could have disastrous water quality impacts on the Yellowstone River which serves as the lifeblood of central and southeast Montana before feeding into the Missouri River.

Industrial-scale gold mines simply do not belong on the border of America's first National Park. There is too much at stake for the land, the water, the wildlife, millions of visitors and the local economy to not protect these lands from mining. I strongly urge you to **support S.941** when it comes before the subcommittee on July 26th.

Thank you for considering our views. Please contact Stephanie Adams, Yellowstone Program Manager at sadams@npca.org or (406) 224-8661 with any questions.

Sincerely,

Ani Kame'enui
Director, Legislation and Policy

777 6th Street, NW, Suite 700 | Washington, DC 20001-3723 | P 202.223.6722 | F 202.872.0960 | npca.org

NATIONAL PARKS CONSERVATION ASSOCIATION * THE WILDERNESS SOCIETY
EARTHJUSTICE * NATURAL RESOURCES DEFENSE COUNCIL
DEFENDERS OF WILDLIFE * SOUTHERN UTAH WILDERNESS ALLIANCE
ALASKA WILDERNESS LEAGUE * CENTER FOR BIOLOGICAL DIVERSITY

TESTIMONY ON S. 468 – THE HISTORIC ROUTE PRESERVATION ACT

SUBMITTED TO THE
SENATE ENERGY & NATURAL RESOURCES COMMITTEE
SUBCOMMITTEE ON PUBLIC LANDS, FORESTS, AND MINING

JULY 26, 2017

The Honorable Mike Lee
Chairman, Subcommittee on Public Lands, Forests, and Mining
Energy & Natural Resources Committee
U.S. Senate

The Honorable Ron Wyden
Ranking Member, Subcommittee on Public Lands, Forests, and Mining
Energy & Natural Resources Committee
U.S. Senate

Dear Chairman Lee & Ranking Member Wyden,

We, the undersigned, are providing written testimony regarding S. 468, the Historic Route Preservation Act. We are groups that represent millions of Americans who are committed to conservation and recreation on our federal public lands. We also have a keen understanding of Revised Statute (RS) 2477 and the history of this law. We appreciate your full consideration of the following testimony.

Revised Statute 2477, commonly referred to as "RS 2477," is a provision in an 1866 mining law intended to facilitate the transportation of goods and people across federal public lands and promote the orderly settlement of the West. To do this, RS 2477 granted rights-of-ways for "the construction of highways across public lands not otherwise reserved for public uses."

Importantly, the Federal Land Policy and Management Act of 1976 (FLPMA) repealed the RS 2477 provision and established an updated process for determining reasonable access to federal lands, with public participation in the decision-making process and long-term, sustainable management goals for these public areas. This process, embedded in "Title V" of FLPMA, was the remedy to replace the ad hoc and sometimes haphazardly applied RS 2477 regime. It provides for the grant of rights-of-way to applicants using a more clearly-defined, sensible process that reflects a more modern approach to resource management.

Today, more than 40 years later, RS 2477 has been resurrected to promote unrestricted development and road construction that often harms our federal public lands. While there are still valid claims of highways that were constructed to help settle the West, the law is being abused to allow for anyone to claim a property right over public lands with little or no evidence that such a right-of-way existed and was used by the public prior to 1976 (or the date that the land was reserved, whichever was earlier). Further, while the courts have jurisdiction to review the validity and scope of R.S. 2477 claims,, S. 468 provides an administrative process that will facilitate fraudulent claims that conflict with both the original intent of RS 2477 and the intent behind its repeal in 1976.

The construction of new highways and roads through some of our most sensitive, pristine public lands would cause water pollution, fragmentation of wildlife habitat, loss of biological diversity, soil erosion and degradation of wilderness values. The following are just a few specific examples of some of America's most prized places that could be impacted by this legislation:

> Alaska. Over 900,000 miles within our public lands in Alaska are at stake, including areas within Denali National Park, Wrangell-St. Elias National Park and Katmai National Park, some of the world's most pristine wildlands.
>
> Utah. State and rural counties in Utah claim at least 15,000 RS 2477 rights-of-way, including jeep trails, cow paths, streambeds and long-abandoned mining tracks.
>
> California. Local counties in California have alleged over thousands of RS 2477 claims in Death Valley National Park.

S. 468 would extend the current 12-year statute of limitations under the Quiet Title Act by giving an expanded category of claimants a full 25 -years to apply for R.S. 2477 rights. And then, in what would amount to a giveaway of federal property, the bill would give the Interior Department just 120 days to make a decision or the R.S. 2477 claim would be deemed valid. The claimants are not even required to produce documents showing evidence to support the right-of-way claim in question. Instead, they can submit maps and stories – even hearsay –from people living in the area willing to corroborate their claim. Additionally, there would be no way for the public to refute a claimed right-of-way or defend our public lands, owned by all Americans, as there currently exists in a court of law.

Unintended consequences are inherent in such a process, including impacts to recreationists, ranchers, private land owners and others that make this bill a dangerous giveaway to anyone who claims they have a right-of-way on public lands.

S. 468 will lead to more conflict of users of public lands, including hunters, anglers, mountain bikers, hikers, and other recreationists not less. For the reasons stated above, we strongly oppose S. 468 as introduced and welcome the opportunity to discuss this further and other potential solutions. For more information, please contact Kristen at (202) 320-2913 or kbrengel@npca.org.

Sincerely,

Kristen Brengel
Vice President, Government Affairs
National Parks Conservation Association

Heidi McIntosh
Managing Attorney, Rocky Mountain regional office
Earthjustice

Phil Hanceford
Conservation Director
The Wilderness Society

Mary Beth Beetham
Director of Legislative Affairs
Defenders of Wildlife

Leah Donahey
Senior Campaign Director
Alaska Wilderness League

Scott Slesinger
Legislative Director
Natural Resources Defense Council

Jen Beasley Ujifusa
Legislative Director
Southern Utah Wilderness Alliance

William Snape
Senior Counsel
Center for Biological Diversity

Testimony of A. Michael Neimeyer

Alaska Native Veteran

In support of S.785 Alaska Native Veterans Land Allotment Equity Act

August 6, 2017

I am writing in support of S. 785, expanding opportunities for Vietnam Era Alaska Native Veterans to apply for Native Allotments. I am Yupik and a USAF Veteran, serving from September 1974 to May 1978.

I was the Land Manager at Calista Corporation from 1982-1996. The major task of the Land Department at that time was managing the ANCSA land conveyances being processed by BLM. Identifying Native Allotments within ANCSA Corporation entitlements and conveyances was part of that management task.

I traveled to all but 3 of our fifty inhabited villages within the Calista Region. I met with all the boards and management of those Village Corporations and attended numerous Village Corporation meetings open to all shareholders.

The Calista Region had twice as many shareholders living within its region as the next largest Regional Corporation. Several Regional Corporations had less than 10% of the number of shareholders living in their region compared to Calista's shareholder population. Largely because of this, our region had the lion's share of all native allotments in Alaska. As a result, my experience with Native Allotments is not insignificant. I was involved with the processing of more Native Allotment applications than any other ANCSA Land Manager. Yet, in all my travels, it was clear to me that veterans in my age group were underrepresented in the allotment applications.

Veterans have a lot in common. I talked to many veterans in the villages, one vet to another. They are patriots. They wanted to serve their country in its time of war. They were aware they might not return home when they enlisted. Some didn't. They served their country's needs better than their own needs. They were aware we were at war but to a man, those I met, were unaware of the Native

Allotment program or any time limit for applications. Consequently, they failed to file a timely application for an allotment that they were otherwise entitled too.

They have the same ties to the land that other Alaska Native applicants, who qualified for an allotment, had. They are certainly as deserving of an allotment as any of those who received one. Some might argue they are more deserving. They only lacked a piece of paper with a date stamped on it. None the less, these men served in their country's armed services in a time of national need. Many saw combat: some spilled their blood for our country.

Many thousands of Alaska Natives signed a piece of paper with a date before December 18, 1971. They got 160 acres of land. In the same time frame; some of their neighbors went to war. They didn't get anything.

I'm pleased Congress is taking another look at the injustice to Alaska Native Veterans in S. 785. Some jurist once said, "justice delayed is justice denied." With this aging group of veterans, it's appropriate we consider these words. Some of the veterans in this relatively small group have already passed away. The laws of nature ensures the rest of us can't be that far behind. Further delays would deny justice to the remaining members of this group of patriots.

Thank you for giving me a chance to add my two cents to the record. I hope my words will shed some light on the harm that is caused when our country blindly favors deadlines and administrative process' over the needs of its most ardent and deserving patriots. I hope you will take to heart the anecdotal evidence I have offered which suggests deadlines and process, thus far, have prevailed in this matter. If there are any questions about my testimony, I can be contacted at 907-272-4294.

2005 Market Street, Suite 1700 215.575.9050 Phone
Philadelphia, PA 19103-7077 215.575.4939 Fax

901 E Street NW, 10th Floor 202.552.2000 Phone
Washington, DC 20004 202.552.2299 Fax
www.pewtrusts.org

Statement of The Pew Charitable Trusts
Regarding S. 32 and S. 1548

Submitted to the Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining

For the record of the legislative hearing held on July 26, 2017

The Pew Charitable Trusts seeks to preserve ecologically and culturally diverse U.S. public lands through Congressionally-designated wilderness, the Presidential establishment of national monuments, Administrative protections, and restoring America's National Park System. To accomplish these goals, we work closely with local interests on place-based efforts to protect special wild lands.

We appreciate the opportunity to submit our views on two of the bills before the Subcommittee for the July 26, 2017 hearing: *The California Desert Protection and Recreation Act of 2017* (S. 32) and *The Oregon Wildlands Act* (S. 1548). These bills will conserve wild lands in California and Oregon for future generations to enjoy.

S. 32: The California Desert Protection and Recreation Act

The Pew Charitable Trusts has worked with Senator Feinstein and her constituents to protect the California desert for a decade. We support S. 32, Senator Feinstein's *California Desert Protection and Recreation Act of 2017*. We applaud the Senator's continued efforts to conserve California's striking and fragile desert landscapes. Senate Feinstein has crafted comprehensive, balanced legislation that takes into consideration the multiple interests and views of those who live, work, or visit the greater California Desert region. This legislation would protect areas that are part of America's natural heritage, contribute to the regional economy, and promote recreation and public enjoyment of shared resources. The Subcommittee has received supportive testimony on similar legislation introduced by Senator Feinstein in previous Congresses. We encourage the full Committee on Energy and Natural Resources to proceed with expedited consideration and approval of S. 32.

S. 32 will preserve spectacular scenic vistas, varied and threatened desert wildlife and plants, and important parts of the Tribal and American history of the region. It would permanently protect 230,000 acres of wilderness; establish several new special management areas, scenic areas, and recreation areas; protect 77 miles of river as Wild and Scenic; expand Joshua Tree and Death Valley National Parks; and facilitate renewable energy development. The legislation

will also provide a further boost to tourism, which is an important component of the local economy.

Senator Feinstein's past efforts to conserve the California desert have enjoyed the support of a diverse assembly of interests, including local business owners and chambers of commerce, city councils, county supervisors, off-road vehicle enthusiasts, hikers, community leaders, conservationists, and veterans. The breadth of support over the years for Senator Feinstein's desert legislation reflects the comprehensive outreach and collaborative approach that Senator Feinstein has taken to developing and tirelessly championing it. We appreciate the Senator's continued leadership and her commitment to protecting critical recreational, ecological, historic, and economic values within the California Desert.

S. 1548 – The Oregon Wildlands Act

The Pew Charitable Trusts is also pleased to support S.1548, *The Oregon Wildlands Act*. Introduced by Senators Ron Wyden and Jeff Merkley, S. 1548 designates approximately 108,000 acres of wilderness in the Wild Rogue and Devil's Staircase areas of Oregon. The bill protects some 252 miles of wild and scenic rivers, and preserves more than 119,000 acres of the Rogue and Molalla watersheds as National Recreation Areas. Like Senator Feinstein's desert bill, this legislation has been years in the making. The Committee has previously received testimony in support of protecting these special lands and waters within Oregon.

These areas are treasured by Oregonians as sources of clean drinking water, for the economic benefits derived from outdoor recreation associated with these lands and waters, and for their wilderness characteristics that provide a unique backcountry experience. Protection of Devil's Staircase and the Wild Rogue is long overdue, and we ask the Committee to move quickly in approving this important legislation.

Oregon is blessed with clean, cool rivers. These waters are home to some of the world's most extraordinary salmon and steelhead runs, and are sources of clean drinking water for Oregonians. The 252 miles of Wild and Scenic river protection in this bill will ensure that more than 1.8 million Oregonians in both rural and urban communities will have access to clean drinking water, and that Oregon's extraordinary wild salmon populations will survive and thrive.

Oregon's ancient forests – some older than 300 years – define the rugged character of the State and provide ecological richness that is almost unparalleled in the continental United States. S. 1548 would protect some of the last remaining stands of these diverse forests. In the Rogue region alone, there are more than 30 types of coniferous trees, including temperate rain-forest species like spruce and hemlock; dry-forest types such as Ponderosa pine and juniper; and stands of Coast redwoods, Alaskan yellow cedar, and the endangered Port Orford cedar.

In addition to their ecological value, the rivers and lands the bill seeks to protect are also a source of recreational and economic opportunities for Oregon. Visitors from around the globe come to explore and enjoy the area's outstanding fishing and paddling opportunities. Outdoor

recreation is extremely important to Oregon's local economies, supporting more than 140,000 jobs and generating some $12.8 billion in consumer spending. Protecting the Rogue and Molalla Rivers as National Recreation Areas will greatly enhance outdoor recreational opportunities and experiences in the region.

Support for protecting these areas as wilderness is broad and long-standing. Local businesses, sportsmen, veterans, and conservation organizations are strongly behind S. 1548's goal of guarding these special wild and rugged landscapes and their rivers and creeks. These are areas that the Wilderness Act was designed to protect for our children and their children. We appreciate Senator Wyden and Senator Merkley's commitment to conserving these valuable lands and waters.

We appreciate the opportunity to submit these views for the Subcommittee's consideration. For additional information, please contact John Seebach, Project Director, U.S. Public Lands, The Pew Charitable Trusts, at (202) 540-6509 or jseebach@pewtrusts.org.

TESTIMONY

Submitted on behalf of

QUADSTATE LOCAL GOVERNMENTS AUTHORITY

Buster Johnson, Chairman; and Supervisor District 3, Mohave County Arizona

In favor of S. 468, Historic Rights-of-Way Preservation Act

Before United State Senate Energy and Natural Resources Committee

July 26, 2017

The QuadState Local Governments Authority strongly endorses the passage of S. 468, the Historic Routes Preservation Act, and one of the pieces of proposed legislation before this committee today. We urge approval by this committee, and recommend its passage by the full Senate.

QuadState Local Governments Authority is a 9-county joint powers authority, with county members lying within four (4) states in the Mojave and Sonoran Deserts. Our Board of Directors has endorsed previous versions of the proposed legislation, have been kept fully informed of its progress in the 115th Congress. Most of our member counties have been affected in one way or another by the current lack of documentation, or the costly and time-consuming method currently recognized as the only way to confirm existing rights-of-ways crossing federal land administered by the Bureau of Land Management (BLM) and the United States Forest Service (USFS). Let me emphasize the word existing. There is nothing in this legislation which permits construction of new roads, or expansion of roads beyond their current dimensions. The roads that are the subject to this legislation must have existed upon the date of repeal of the statute, R.S. 2477, on October 21, 1976, the date of passage of the Federal Land Policy and Management Act of 1976.

Thousands of miles of county roads in the West exist on federal land by virtue of R.S. 2477, a part of the Mining Law of 1866. This was a settlement facilitation law, and it worked to ultimately create much of the rural transportation network in the West. By the time it was repealed in 1976, it had done its job. The problem, however, is that the law, dating from the early years of Westward expansion, did not require paperwork. There was no permitting action as we know today, nor certificate or easement provided the builder of the road, or highway, as it was known then. As a result, the current official records of the federal real estate holdings, the Master Title Plats (MTPs) maintained by the BLM, contain no official notation that the rights-of-ways were granted, let alone even exist.

Many counties, for variety of reasons, have sought to confirm these rights-of-ways. They have found the only means available is to file a quiet title action (QTA) in Federal District Court. This is an expensive and time consuming process. One of our members spent six years getting a ruling and decision from the Court, which involved negotiations with the Department of the Interior attorneys. No one, including the intervening environmental organizations, challenged the roads, *per se*, and their existence prior to 1976, yet the discussions continued over size, scope, maintenance, and whether Title V of the Federal Land Policy and Management Act was the more appropriate vehicle to use for issuance.

Testimony S. 468
Buster Johnson, Chairman, QuadState Local Governments Authority
July 26, 2017

Let me say a bit about the Title V approach. It ignores that the County already holds a right-of-way for the route in question. It just lacks a proper piece of paper to prove it. Road maps from the Auto Club, from State Tourism, and even Transportation Plans of the County, may show a road, but on BLM records it doesn't exist! BLM proposes to use Title V to issue a new right-of-way. This opens the road to the National Environmental Policy Act (NEPA) for review of whether the road should exist and is in the "right" location. And next, it opens the door for consultation about the route under Section 7 of the Endangered Species Act (ESA) and Section 106 of the Historic Preservation Act. These consultations in many areas could open the road to limitations on maintenance activity, and require installation of additional capital improvement under Terms and Conditions imposed by the U.S. Fish and Wildlife Service (FWS) or the State Historic Preservation Officer (SHPO). Most counties lack financial wherewithal to even keep up with routine maintenance in remote desert or timbered areas, let alone construct high cost structures such as tortoise-proof fencing along the routes. It may be desert tortoises being of concern in our area, it could be sage grouse, or other species of concern in the northern areas of the Great Basin and Great Plains. And these structures or facilities could be required even in the absence of any showing of mortality among species of concern, just the threat that "something might happen."

One of our member counties took current GPS mapping of its roads to the BLM State Office in Reno for recordation on the MTPs. It was told that it had to get a court order to confirm its rights-of-ways.

A final note, Iconic Route 66 across the Southwest is not on the records, with the exception, that we can find, of a 20-mile stretch west of Needles CA, which was confirmed in the QTA brought by San Bernardino County.

So what does S. 468 do? Simply, it provides for a simple, and timely application process and administrative means to secure right-of-way or easement confirmation, and assure its recordation on the MTPs maintained for the federal land records. It delegates to the agencies, BLM and USFS, the review of proof of existence, and substitutes an administrative action for the costly process of going to court for such confirmation. It does not mean, that if there are differences of opinion on the proof, the avenue of a court venue is out of reach, but it would only lead to court action if there were disagreements regarding the proofs. Further, it affirms the 2005 10th Circuit Court of Appeals decision, which held that the Secretary could not apply, retroactively, terms, conditions, and standards on the rights-of-ways prior to consideration for approval. The role of the Department of the Interior was, in that decision, deemed strictly ministerial, to look at the proof supplied and see that it complied with the original law. The legislation proposed in S. 468 provides legislative confirmation of that process.

The proposed legislation also does two other things which might be considered controversial, but which are not.

First, the legislation would waive the statute of limitations. R.S. 2477 makes reference to applying to land not otherwise reserved. This is interpreted as withdrawn for other purposes. The statute of limitations normally applies for a 12-year period after reservation. It must be waived, at least for the 25 years under which this legislation will apply, so that the law will apply to rights-of-way within National Forests, and also a myriad of other reserves and withdrawals such as those made for Reclamation

purposes (US Bureau of Reclamation), public water reserves, and other such actions taken by the government over the past 150 years. The law will not apply within congressionally designated units of the National Park Service, nor military reservations, nor Indian reservations.

Second, the law removes the restriction placed on the Secretary of the Interior in 1997 from issuing regulations regarding roads on federal lands. Only by doing this can the Secretary issue regulations to implement this Act. But is important that such regulations shall not contain regulatory restrictions prescribing construction standards or other matters other than the existence of the route on October 21, 1976.

In conclusion, I wish to place on the record a few other items about the proposal.

This should be considered as a non-partisan Act of Congress. It is does not undo any previous action allowed on public land. It is intended only to facilitate local governments securing a modern proof and confirmation that the right-of-way exists, that they may expend public funds for maintenance on it, and it is officially recognized on the official records of the United States.

The legislation, if passed, is voluntary. It places no burden, financial or otherwise, on any local government to comply or even take action if they believe they don't require a confirmation of any particular right-of-way. And with the minimal adjudication requirements placed on the federal land management agencies, it should not create an undue workload for federal officials.

The legislation, if passed, has a sunset of 25 years. The authors believe that such is necessary to permanently bring this last vestige of settlement to a close. Doubtless the authors of the Federal Land Policy and Management Act (FLPMA) did not contemplate that 41 years after its passage, confirmation actions would remain outstanding, let alone almost wholly un-adjudicated. But we agree that such a sunset is appropriate to assure that local governments put off application and defer to others, not yet in office, an obligation "to someday get around it."

And lastly all must recognize that changes to any right-of-way confirmed under this legislation will revert to consideration under the appropriate law and regulation in effect for new routes, in effect, Title V of FLPMA. It recognizes the existing route, as it exists, berm to berm, but realignment or widening reconstruction will require appropriate agency review and consultations. But absolutely, it does not create new routes and roads where none exist today.

Our organization, and I, endorse this legislation, and urge its prompt approval by this committee, and movement to the floor of the Senate, where we hope for ultimate passage. As stated, it is essentially non-partisan, and should be viewed by all as being simply a good and responsible government action.

Thank you.

Southeast Alaska
Conservation Council

224 Gold St.
Juneau, AK 99801
(907) 586-6942

Sent via email (fortherecord@energy.senate.gov)

August 4, 2017

The Honorable Mike Lee
Subcmte Chairman
Subcmte on Public Lands, Forests and Mining
U.S. Senate Energy and Natural Resources Cmte
Washington, DC 20510

The Honorable Ron Wyden
Subcmte Ranking Member
Subcmte on Public Lands, Forests and Mining
U.S. Senate Energy and Natural Resources Cmte
Washington, DC 20510

re: Testimony for the Record of July 26, 2017 Subcmte Hearing

Dear Chairman Lee and Ranking Member Wyden:

On July 26, 2017, the Subcommittee held a legislative hearing on fifteen proposed bills, including the Alaska Native Veterans Land Allotment Equity Act (S. 785) and a bill to repeal the export prohibition on lands previously conveyed to the Kake Tribal Corporation (S.1149). Please accept the testimony of the Southeast Alaska Conservation Council on these bills and incorporate it into formal July 26, 2017 Subcommittee hearing record.

Although SEACC has supported equitable treatment for Alaska Native Veterans who missed the opportunity to obtain an allotment due to their service in the Vietnam War, we believe the bipartisan model utilized by Congress on this issue in 1998 and 2000 represents the best approach. The proposed legislation (S. 785) creates an entirely new set of inequities among veterans and Alaska Natives alike and is inconsistent with previous bipartisan efforts to resolve this issue.

By changing the scope of available lands for allotments, as well as existing rules for establishing use and occupancy of those lands, S. 785 essentially establishes a new land entitlement instead of correcting for a missed opportunity. By drastically expanding lands eligible for selection, including all Tongass lands other than National Monuments, S. 785 makes lands previously designated by Congress as Wilderness eligible for allotment selection. The bill also removes the requirement for consultation with the Secretary of Agriculture on the compatibility of an allotment application for lands within a Conservation System Unit with the purposes for which that Conservation System Unit was established. Importantly, the bill also lacks ironclad protections for the nearly 900,000 acres of Tongass Legislated LUD II roadless wildlands. In 1990, and again in 2014, the U.S. Senate unanimously designated these Tongass wildlands for perpetual protection in the 1990 Tongass Timber Reform Act and the 2014 Sealaska Lands Bill.

To the extent claims still exist from the original class of veterans, Congress should re-open the allotment process for Alaska Native Vietnam Veterans who were serving when the program sunset in 1971, using the 1998 model, as amended in 2001. This approach would protect the integrity of those public lands previously designated by Congress on the Tongass National Forest, while ensuring that no Alaska Native veteran who served in Vietnam misses the opportunity to make an allotment claim by the criteria that applied at that time.

S. 785 also authorizes compensatory acreage for Native Corporations that voluntarily relinquish lands selected in order to make such lands available for Veteran allotments. Section 14(h)(6) of ANCSA, however, provided that "all allotments approved . . . during the four years following the date of enactment of [ANCSA]" was to

be "charge[d] against the 2 million acres authorized to be conveyed" to the regional corporations.[1] To the extent this legislation is intended to reopen Native allotment applications pending on the date of ANCSA's enactment in 1971, why does S. 785 treat allotment applications for Regional Corporation lands differently now? Arguably, if an Alaska Native veteran applies for an allotment on lands conveyed to Regional Corporations under Section 14, that corporation is not entitled to compensatory land.

Senate Bill 1149 repeals a provision from an earlier amendment of the Alaska Native Claims Settlement Act (ANCSA) prohibiting the export of timber from about 1,100 acres of land at Jenny Creek, on north Kupreanof Island that the State of Alaska conveyed to Kake Tribal Corporation. This conveyance was part of a broader agreement in which Kake Tribal Corporation agreed to place nearly 2,400 acres of its own land in Gunnuk Creek watershed, Kake's primary source of drinking water, into a conservation easement. At the time, then-Senator Frank Murkowski inserted the export restriction "to maintain a timber processing industry in Southeast Alaska." While all logs cut from the Tongass National Forest lands should support manufacturing jobs here at home, instead of Asia, we do not object to lifting this export ban on private land because it treats Kake Tribal differently from other Native Corporations to the disadvantage of its shareholders.

Thank you for considering this testimony on S. 785 and S. 1149.

Best Regards,

Buck Lindekugel
Grassroots Attorney

---

[1] *See* Section 14(h)(6) of ANCSA, *codified at* 43 U.S.C. § 1613(h)(6)(2015).

July 25, 2017

The Honorable Lisa Murkowski
Chair, Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member, Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Chairman Murkowski and Ranking Member Cantwell,

We write in opposition to S. 468, the Historic Routes Preservation Act, which is receiving a hearing on July 26, 2017 before the Subcommittee on Public Lands, Forests and Mining, and strenuously urge that your committee oppose this bill.

S. 468 purports to provide a streamlined means of resolving claims under Revised Statute 2477, or RS 2477, a repealed Civil War-era grant of highway rights-of-way. But the bill amounts to an unprecedented giveaway of public lands. It overwrites longstanding state and federal case law concerning the nature, validity, and scope of RS 2477 rights-of-way, allowing claimants, including private companies and individuals, to gain title to untold thousands of rights-of-way across public lands *regardless* of their validity under RS 2477. The resulting land grab would sabotage the stewardship and management of the West's most sensitive and iconic public lands.

RS 2477 was enacted in 1866 to grant rights-of-way across federal lands to the prospectors and homesteaders the federal government was at that time trying to encourage to settle the West. Congress repealed RS 2477 in 1976 when it passed the Federal Land Policy and Management Act (FLPMA). However, Congress also provided that valid existing rights established prior to FLPMA's enactment would be recognized if the terms of the grant were met.

Though on the books for over 110 years, RS 2477 received little attention until after its repeal. In passing FLPMA, Congress ushered in a new era of federal land retention and management, and included requirements that federal land managers inventory and protect millions of acres of wilderness-quality landscapes. But beginning in the 1980s, opponents of FLPMA's conservation measures sought to undermine protections by claiming road rights-of-way under RS 2477.

Opponents began using RS 2477—just one of a slew of right-of-way grants—to claim faded two-tracks, cow paths, and wash bottoms as "highways" that, if developed, could disqualify lands from wilderness eligibility and other protections. In 1996, three counties in Utah illegally bulldozed and graded roads in Grand Staircase-Escalante National Monument, claiming their authority to do so under RS 2477. Most recently, in 2012, the State of Utah claimed more than 14,000 RS 2477 rights-of-way, including claims in national parks, congressionally-designated and eligible wilderness areas, national monuments, and other environmentally and ecologically critical lands. The vast majority of claims—unimproved dirt roads and trails—do not connect local communities, nor are they used to bus children to school. And the evidence that might show acceptance under RS 2477 (or lack thereof) has similarly faded with time.

S. 468 seeks to validate these spurious claims and many thousands more across the West by drastically lowering evidentiary burdens and fundamentally redefining the law surrounding RS 2477. It provides that claimants need only submit certain documents—for example, surveys, plat maps, or aerial

photographs, whether historical or contemporary—that say *nothing* about whether a right-of-way was constructed and accepted under RS 2477. And the bill allows claimants to use just hearsay testimony of requisite public use. In other words, a claimant need only proffer a recently made map and speculative, secondhand statements to divest the United States of its title.

S. 468 also rewrites many of the legal standards for acceptance of an RS 2477 right-of-way. The bill allows claimants to show acceptance of a so-called public highway despite no evidence of public use. It illogically includes federal lessees and permittees as members of the public, contrary to a longstanding tenet of public highway law and Tenth Circuit Court of Appeals precedent. And by defining "continuous public use" simply as use "generally regarded by the public to be convenient or necessary," the bill adopts a standard the Tenth Circuit specifically rejected in its *San Juan County, Utah v. United States* decision as "contravene[ing] congressional intent."

Moreover, S. 468 bypasses reasonable existing means for quieting title to valid RS 2477 rights-of-way. The Quiet Title Act, 28 U.S.C. § 2409a, allows claimants to bring claims against the United States to property rights, including alleged RS 2477 rights-of-way, in federal court. Alternatively, Title V of FLPMA provides an administrative process for obtaining rights-of-way from the Bureau of Land Management following an agency review.

Ultimately, the true purpose of the bill is not to streamline RS 2477 claims but to rubberstamp them, and in so doing undermine the protection of the American West's most pristine public lands. S. 468 specifically allows claims in wilderness study areas, areas of critical environmental concern, and lands with wilderness characteristics, furthering the radical use of a repealed and outdated statute as a weapon to attack public land protections.

We strongly urge you to oppose this legislation.

Thank you,

Joe Bushyhead
Staff Attorney
Southern Utah Wilderness Alliance

Statement of
Senator Dan Sullivan
Senate energy and Natural Resources Committee
Subcommittee on Public Lands, Forests and Mining
S. 785 Alaska Native Veterans Land Allotment Equity Act

August 9, 2017

Thank you Chairman Lee and Ranking Member Wyden for including S.785, the Alaska Native Veterans Land Allotment Equity Act in this hearing in the Subcommittee on Public Lands, Forests, and Mining of the Senate Committee on Energy and Natural Resources. As you well know, this is not a new bill; it has been an ongoing effort for the Alaska Congressional Delegation for many years and different iterations have been introduced in numerous previous Congresses.

I thank Senator Murkowski for her co-sponsorship, and advocacy over the years.

As the newest member of the Alaska delegation, last Congress, I took up the issue with a renewed fervor, testifying before this very subcommittee and the full Energy and Natural Resource Committee, and I am passionately continue those efforts today. I am advocating on behalf of Alaska Native Vietnam Veterans who have been denied the opportunity to apply for a native allotment.

As the bill's title suggests, this is an issue of equity. Equity for the men and women who left their family, friends, and homes to serve their nation during one of the most controversial conflicts our nation has known.

I have said this many times before, but it's worth every reiteration: Alaska Natives and American Indians boast higher rates of military service than any other ethnic group in the nation. *Any other group in the nation.*

A population that has been mistreated by the federal government since its inception, boasts the highest numbers in service to that very same government. Now that is a special kind of service, a special kind of patriotism. A special kind of service that should not be met with an obstruction of rights afforded to other Alaska Natives while they were away serving their country so courageously.

Unfortunately, that is the case with about 2,800 Alaska Natives who served during the Vietnam War era. While these veterans were serving their country, their family and friends were negotiating the largest land claims settlement in the history of our country. The Alaska Native Claims Settlement Act of 1971 was negotiated, agreed to, and signed into law all during the Vietnam War. Commonly referred to as ANCSA, this landmark legislation extinguished the opportunity for individual Alaska Natives to apply for a personal allotment of up to 160 acres, which was granted to them by the Alaska Native Allotment Act of 1906.

In 1998, Congress passed a bill (P.L. 105-276) to try to address these issues, but it didn't fully resolve them. Under the previous bill, Alaska Native Vietnam veterans that served during the most

critical years of the era were considered to be eligible to apply for an allotment. But this only covered a subset of those who were denied the opportunity to apply for an allotment while serving their nation, while also presenting other obstacles to those which were eligible.

Another problem that wasn't addressed in the 1998 bill is there are four regions in the state where NO VETERANS were approved for their allotments. Four Regions, which make up all of the North Slope, all of Southeast, and all of Southcentral. The North Slope alone is nearly 5 million acres. The applications from those regions were largely denied because of a lack of land base to choose from. There were a number of other problems with the previous bill, which my bill now attempts to address.

Last but not least, I'd like to thank Secretary Zinke for meeting earlier this year with a number of Alaska Native Veterans, including Vietnam era veterans. That meeting was powerful; hearing directly from our brothers, brothers that have served our great country in times of conflict, just like the Secretary. I am thankful this new administration supports my goal of equity, and has committed to working on this issue as a partner, not an adversary.

I stand ready and willing to work with whomever to make sure those who sacrificed so much receive the land they weren't afforded because of their service to our great nation in a time of conflict.

More than 40 years have passed since the Vietnam War. Our Vietnam veterans are getting older, many have already passed; it's time to right this wrong for our Alaska Native Vietnam veterans.

Steve Moyer
Vice President of Government Affairs

July 25, 2017

The Honorable Mike Lee, Chair
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
United States Senate
Washington, DC 20510

The Honorable Ron Wyden, Ranking Member
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests, and Mining
United States Senate
Washington, DC 20510

RE: Senate ENR Subcommittee on Public Lands, Forests and Mining Hearing to Receive Testimony on Various Bills 7/26/2017).

Dear Chairman Lee and Ranking Member Wyden,

I am writing on behalf of Trout Unlimited (TU), and our 300,000 members and supporters nationwide, to offer our views on the following legislative proposals listed for consideration during the Subcommittee's July 26, 2017 Legislative hearing.

TU Supports:

- S.1548, the Oregon Wildlands Act.

TU Opposes:

- S.1230, the Water Rights Protection Act.
- S. 785, the Alaska Native Veterans Land Allotment Equality Act.

We detail our comments in the attached letters. Thank you for considering our views.

Sincerely,

Steve Moyer

A mission to conserve, protect, & restore North America's coldwater fisheries and their watersheds.
National Office: 1777 N Kent St., Suite 100, Arlington, VA 22209
T: (703) 284-9406 F: (703) 284-9400 smoyer@tu.org www.tu.org

July 25, 2017

Re: TU Supports S.1548, the Oregon Wildlands Act.

Dear Chairman Lee, Ranking Member Wyden, and members of the Subcommittee:

Trout Unlimited strongly supports S.1548, the Oregon Wildlands Act. This bill seeks to add additional protections to a variety of public lands in Oregon that are very important to TU members, as well as the citizens of Oregon.

Trout Unlimited's mission is to conserve, protect, restore and reconnect North America's trout and salmon fisheries and their watersheds. National forests provide crucial habitat for trout, salmon and steelhead, and some of the best fishing in the country. S. 1548 will provide important permanent protections that are desperately needed to sustain quality fisheries on our national forests in Oregon, by allocating certain tracts held by the BLM to create national recreation areas and additional wild and scenic river designations in Oregon.

One particular area that would benefit from this bill is the Rogue River, known for some of the very best salmon and steelhead fishing in the lower 48. Amazing runs of summer and winter steelhead, strong runs of fall and spring chinook, and ESA-listed coho salmon keep anglers coming to towns like Gold Beach, Agnes, and Grants Pass, Oregon year-around.

The economic benefit of a healthy fishery for these southwest Oregon towns and cash-strapped counties cannot be overstated. Thousands of anglers from all over the country visit the region and spend tens of thousands of dollars at local hotels, restaurants, gas stations, grocery stores and tackle shops. Long-term protections of this valuable economic engine is crucial. This bill would provide benefit to many of Oregon's great wild lands and the people, fish and wildlife that depend upon them

For questions related to these comments, please contact the following:

Dean Finnerty
SW Oregon Field Rep
Sportsmen's Conservation Project
dfinnerty@tu.org

Kate Miller
Director of Government Affairs
kmiller@tu.org

July 25, 2017

Re: TU Opposes the Water Rights Protection Act (S.1230).

Dear Chairman Lee, Ranking Member Wyden, and members of the Subcommittee:

Trout Unlimited opposes S.1230, the Water Rights Protection Act as currently written and we offer the following comments with the hope that we can work with the bill sponsors and members of the subcommittee to make improvements to the bill text.

The Water Rights Protection Act Is Overly Broad.

TU opposes The Water Rights Protection Act in its current form because it is overly broad. The bill's inception, to address the U.S. Forest Service (USFS) ski area water rights clause, has already been reversed and removed by the agency. The bill, however, goes well beyond a measure designed to ensure that a similar water rights clause is not again imposed. Sections 3(3) and 4 of the Act, for example, call into question the long- standing authority of the USFS to condition uses of National Forest lands and waters in order to protect fish and wildlife.

The Water Rights Protection Act Curtails Federal Land Stewards' Ability to Provide Drought Resilience.

TU does not support the Water Rights Protection Act because it limits the federal agencies' ability to be effective stewards of aquatic resources on public lands. The Department of the Interior's and USFS' authority to require permit conditions for the protection of fish and wildlife is essential to the agencies' ability to provide habitat protections and to provide drought resilience that benefits downstream water users and communities. In particular, Section 5(a) of the Water Rights Protection Act's savings clause for by-pass flow authority reverses decades of USFS authority that it has exercised to benefit trout fisheries, imperiled species, and drought resilience on National Forest lands.

A success story based on the USFS' authority is the rebuilding of Colorado's native Greenback cutthroat trout—the largest restoration effort in Colorado for the Greenback, that will ultimately produce nearly 40 miles of connected streams and lakes supporting the Greenback cutthroat. This success story started with TU's challenge to the USFS permit granted for expanding the Long Draw Reservoir that failed to include protections for fish and wildlife. The federal court decision upholding the USFS' stewardship obligations was then implemented by the parties: the Water Supply and Storage Company, State of Colorado, USFS, and Colorado TU. One of the last stages of this effort was recently announced in which the Water Supply and Storage Company is providing a trust fund, with Colorado TU acting as trustee, and the USFS taking responsibility for project implementation. Colorado's rarest native trout will benefit, and the aquatic resources enhanced and protected at a landscape scale will serve all Coloradans.

We have spent a good deal of time on considering this bill's previous versions and House counterparts, and we offer the following suggestions to make the bill neutral with regard to federal bypass flow authority, and other federal authorities specifically enumerated in the bill's savings clauses.

Specific Suggestions:

- Sec. 2, paragraph (2), strike "filed";
- Sec. 3, paragraph (1), strike "or on any impairment of title or interest, in whole or in part";
- Sec. 3, strike paragraph (3), including 3(A) and 3(B);
- Sec. 4, paragraph (1)(B), strike "and imposes no greater restriction or regulatory requirement, than"
- Sec. 4 – strike subpart (2)(A)(iii) and paragraph (B).
- Sec. 5 – paragraph (a), strike "any".

Conclusion

TU looks forward to working with the Committee to ensure that the Water Rights Protection Act does not keep future success stories like Long Draw Reservoir's Greenback cutthroat trout from happening. We would be happy to work with the Committee and the bill's cosponsors to modify the bill to address our concerns.

Thank you for your time in considering these important issues. For questions related to these comments, please contact the following:

Laura Ziemer
Senior Policy Director
Trout Unlimited's Western Water Program
lziemer@tu.org

Steve Moyer
Vice President for Government Affairs
smoyer@tu.org

July 25, 2017

RE: Opposition to the Alaska Native Veterans Allotment Equity Act (S. 785).

Dear Chairman Lee, Ranking Member Wyden, and members of the Subcommittee:

We are writing to express opposition to the Alaska Native Veterans Allotment Equity Act (S. 785). Instead of fixing any inequities that persist on an individual basis with Alaska's century-old allotment scheme, this bill uses a broad brush to create a whole new allotment system with a host of new problems. As such, we encourage committee members to oppose this legislation until further factual inquiry can occur and a narrowly-tailored solution is crafted to address outstanding valid claims within the spirit and intent of the original Allotment Act.

As currently written, this bill would reopen the 1906 Alaska Native Allotment Act for the third time and allow an untold number of individuals or their heirs to select and receive two allotments each totaling up to 160 acres per person. Individuals who previously received an allotment of fewer than 160 acres could receive a second allotment to make up the difference. Allotments could include any vacant federal land in Alaska outside of the TransAlaska Pipeline, National Parks, National Preserves, or National Monuments. This would create a patchwork of inholdings across Alaska where many of the most valuable and important parcels—including Wilderness areas, wildlife refuges and LUD II lands, among other areas—become private and off limits to the public.

A bill similar to S. 785 passed Congress and was signed into law in 1998. That law reopened the Alaska Native Allotment Act for an 18-month period for individuals that were entitled to receive an allotment but that were unable to meet the deadline to stake their claim because of service in the Vietnam War. This new bill once again reopens the Allotment Act and allows new claims for a 3-year period. However, the bill also greatly expands the pool of eligible individuals who may make a claim by allowing individuals that served in the war even after the deadline passed, or their heirs, to stake a claim.

In addition to expanding the pool of eligible individuals, S. 785 greatly expands the pool of lands that may be selected without appropriate safeguards for other public land users or for important fish and wildlife habitat. The bill entirely eliminates the requirement for a personal connection to the land that is selected. The original Allotment Act was designed to allow Alaska Natives to receive allotments to their historic or ancestral lands. By removing this requirement altogether, this bill encourages individuals to select the most valuable lands wherever they may be and becomes a giveaway of the most valuable federal public lands and resources for individual gain.

Another major concern with S. 785 is that the bill allows individuals to claim two separate allotments instead of a single allotment and allows individuals that have already received an allotment to receive a second allotment if their first was fewer than 160 acres. This provision could effectively double the

number of allotments, even further fragment federal lands, even further cut-off access to adjacent public lands, and unduly complicate federal land management and use.

If enacted into law, S. 785 has the potential to create thousands of private inholdings totaling hundreds-of-thousands of acres across Alaska at the most valuable and important sites. Whether along Alaska's ever-popular Kenai River where it flows through the Kenai National Wildlife Refuge, BLM lands along Bristol Bay's world-class Kvichak River, oil riches in the Arctic National Wildlife Refuge, vital sockeye salmon subsistence fisheries in the Tongass National Forest, or countless other locations near and dear to anglers, hunters, outfitters, guides, and subsistence users, S. 785 would privatize and cut-off public access to many of Alaska's best and most valuable places.

Alaska public lands are part of what make this state so great and are the reason why many Alaskans call this beautiful state home. Rather than addressing the few outstanding inequities in Alaska's Native Allotment system in a tactful and precise manner, S. 785 creates a whole new scheme that cuts off public access to important lands, gives away our most valuable public land and resources, threatens important fish and wildlife habitat, fragments public lands and makes the already difficult task of federal land managers even more so. For these reasons, TU opposes the bill. As ever, we stand ready to work with the Committee to conserve the outstanding resources of Alaska's world class federal lands.

For questions related to these comments, please contact:

Austin Williams
Alaska Director of Law and Policy
awilliams@tu.org

Steve Moyer
VP of Government Affairs
smoyer@tu.org

Kate Miller
Director of Government Affairs
kmiller@tu.org

Statement for the Record
U.S. Forest Service, United States Department of Agriculture
Before the
Senate Committee on Energy and Natural Resources
Subcommittee on Public Lands, Forests and Mining
Concerning
S. 1149 - Kake Tribal Corporation Export Restriction Act
July 26, 2017

Chairman Lee, Ranking Member Wyden, members of the Subcommittee, thank you for the opportunity to present the views of the U.S. Department of Agriculture (USDA) regarding S. 1149 – the Kake Tribal Corporation Export Restriction Act.

S. 1149 would repeal a timber export prohibition that was enacted in 2000 as part of the Kake Tribal Corporation Land Transfer Act (Public Law 106-283, October 6, 2000, 114 Stat. 867) (Kake Act). The Kake Act reallocated lands and land selection rights among the State of Alaska, Kake Tribal Corporation, and the City of Kake. The Kake Act also involved conveyance of 1,389 acres of federal lands to Kake Tribal Corporation and Sealaska Corporation. Conveyance of land interests was completed in 2001 and Forest Service considers the Kake Act to be fully implemented. The Forest Service does not have a role in Kake Tribal Corporation's timber sale activities and therefore has no position on the bill.

Thank you again for the opportunity to provide this statement for the record.

RESOLUTION NO. R-2017-2219

A RESOLUTION SUPPORTING THE SOUTHERN UTAH OPEN OHV AREAS ACT SPONSORED BY SENATOR ORRIN HATCH AND CONGRESSMAN CHRIS STEWART

WHEREAS, Senate Bill 837 (115th Congress) and House Bill H.R. 1961 (115th Congress) (hereinafter "OHV Bill") if passed into law would transfer ownership of the only remaining open ride off highway vehicle ("OHV") area in the county to ensure that it remains an open ride area;

WHEREAS, the OHV Bill also exchanges school trust lands in the OHV area for other land in the County and provides for a reservoir and pipeline site for the Washington County Water Conservancy District;

WHEREAS, OHV events and usage within the county have increased dramatically over the last 10-15 years resulting in a need to protect areas for operating OHVs;

WHEREAS, the Sand Mountain area is a unique setting for open OHV riding that can't be duplicated;

WHEREAS, the Sand Mountain area currently hosts several events each year that bring in at least $3 million to the County's economy;

WHEREAS, it is in the best interest of the citizens of the County to have the County participate in protecting and operating the Sand Mountain area for open OHV riding;

WHEREAS, it is in the best interest of the citizens of the county to support the Washington County Water Conservancy District's long-term plan to meet the water needs of our county by supporting the proposed reservoir and pipeline sites; and

WHEREAS, it is in the best interest of the County to support the Utah School and Institutional Trust Lands Administration ("SITLA") in exchanging scattered parcels of land for land that will add value to the school trust.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNTY COMMISSION OF WASHINGTON COUNTY, UTAH, that Washington County supports the attached Senate Bill 837 (115th Congress), sponsored by Senator Orrin Hatch, and House Bill HR 1961 (115th Congress) sponsored by Congressman Chris Stewart.

VOTED UPON AND PASSED BY THE WASHINGTON COUNTY COMMISSION AT A SPECIAL MEETING OF THE WASHINGTON COUNTY COMMISSION HELD ON THE 25th day of July, 2017.

(Signature block on following page.)

WASHINGTON COUNTY

for

VICTOR IVERSON, Chair

ATTEST:

Kim M. Hafen
Washington County Clerk-Auditor

Commissioner Iverson voted Aye
Commissioner Renstrom voted Aye
Commissioner Cox voted Aye

Approved as to Form:

Deputy Washington County Attorney

WASHINGTON COUNTY
WATER CONSERVANCY DISTRICT

July 21, 2017

The Honorable Orrin Hatch
United States Senate
104 Hart Senate Office Building
Washington, D.C. 20510

Re: Southern Utah Open OHV Areas Act

Dear Senator Hatch,

I write to express support for the Southern Utah Open OHV Areas Act (S. 837). Washington County Water Conservancy District (District) is tasked with providing water to one of the driest and fastest growing regions in the state of Utah. This legislation strikes the right balance by protecting and maintaining access to critical water resources throughout Washington County while providing for continued off-highway vehicle (OHV) recreation.

The same unique topography that makes Washington County one of the most highly recreated areas also limits viable locations for water and power infrastructure. In its creation of OHV recreation areas, S. 837 identifies corridors to help preserve the District's access to important water resources and facilities. S. 837 also enables the District to continue manage its water future and provide critical water supply for the region.

Thank you for your leadership on this legislation.

Sincerely,

Ron Thompson
General Manager

533 E. Waterworks Drive St. George, UT 84770 P: 435.673.3617 F: 435.673.4971 wcwcd.org

August 6, 2017

The Honorable Lisa Murkowski
Chairman
Comm. on Energy & Natural Resources
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member
Comm. on Energy & Natural Resources
511 Hart Senate Office Building
Washington, DC 20510

RE: Yellowstone Gateway Protection Act, S.941

Dear Chairman Murkowski and Ranking Member Cantwell:

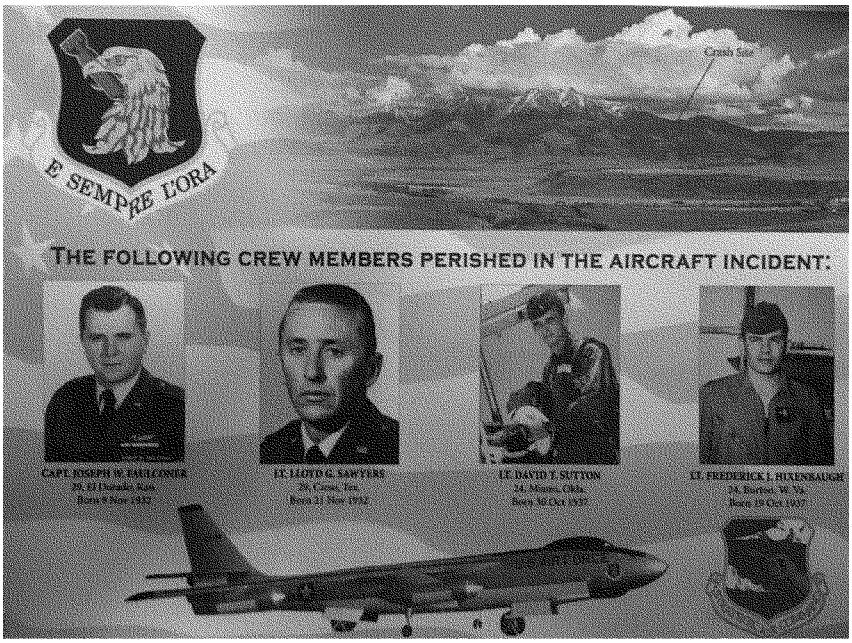
Please accept this testimony into the official record for the July 26, 2017 hearing of the Committee on Energy and Natural Resources Subcommittee on Public Lands, Forests and Mining. The Subcommittee Chairman, the Honorable Senator Lee, stated the record would remain open for two weeks following the hearing.

Thank you, Chairman Murkowski, Ranking Member Cantwell, Subcommittee Chairman Lee and Members of the Senate Committee on Energy and Natural Resources for holding this hearing and the opportunity to supply testimony in support of the Yellowstone Gateway Protection Act, S.941.

On the evening of July 23, 1962 while on a routine flight from Dyess Air Force base near Abilene, Texas, four U.S. Ari Force crew members lost their lives after their B-47E Strategic Air Command (SAC) bomber crashed into Emigrant Peak in Paradise Valley, MT. Strategic Air Command patrol bombers were a common sight in our Montana skies during the Cold War era. The SAC formed in 1946 to maintain a global nuclear deterrent force.

Because of its speed the aircraft was generally flown at extremely low altitudes to practice its maneuver of ascending quickly to release its bombs, and immediately advance into a drive to avoid enemy radar. This particular maneuver was regularly practiced in the upper Yellowstone Valley and the night flight that took place on July 23, 1962 was no different. The normal routine flight had the plane at 23,000 feet over Dillion, MT, 15,000 feet in the Emigrant Peak area, and 8,000 feet east of Livingston.

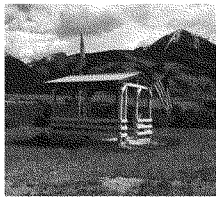
The last communication made from this particular plane was when the airmen made radio contact as the bomber passed over Dillon. Soon thereafter the 107 foot long B-47E crested the Gallatin Divide and flew into the southwest side of Emigrant Peak. The crew consisted of Captain Joseph Faulconer, instructor pilot, 1st Lt. Lloyd Sawyers, pilot, 1st. Lt. David Sutton, co-pilot and 1st Lt. Fredrick Hixenbaugh, navigator. Lieutenant's Hixenbaugh and Sutton few remains are interred at Arlington National Cemetery (Section 30, Graves 292-1 & 292-2). Any trace and the spirit of CPT Faulconer and LT Sawyer remain on Emigrant Peak.



After more than a year effort by countless individuals and in cooperation with the U.S. Air Forc and Dyess Air Force base, on July 23, 2016 a special memorial to these special young men was dedicate under the watchful eye of Emigrant Peak while surrounded by surviving family members and descendants, military officers and politicians of every party.

Senator Daines paying respects to our fallen heroes on July 23, 2016 at the B-47E Bomber memorial dedication.

The gravel access road to this peaceful and contemplative memorial is the same road that gold mining operations will use. The serenity and beauty provided here would be destroyed by the massive number of trucks, helicopters and equipment required to develop a mine. The crash site itself is located inside the withdrawal perimeter proposed the Yellowstone Gateway Protection Act, S.941 and would be protected from future mining activity.



Our family has lived in Emigrant Gulch since the late 1800s and we even remember hearing this crash on that fateful night in 1962. Currently, three generations of our family still reside here making our living through a combination of vacation rentals, a butcher shop, a photography business, sewer pumping and maintaining the local state highway rest stop, which we've done every single day for more than 20 years. We have seen every mining company in Emigrant come and go. All of them are long on promises and short on memory once they pack up or run out of money. Meanwhile, we've seen the pulse of Yellowstone and the surrounding recreation and tourism continue to flourish, even during the most recent great recession.

The old-timers up in Emigrant Gulch, including our ancestors, were essentially mining for food, scratching out just enough dust to buy groceries at the Emigrant Store. In the decades since, we've been witness to God's renewal of the Gulch where it is home again to forests (they were all cut down by 1930), riparian habitat, and wildlife like Canada lynx, grizzly bears, wolverine, lions, mountain goats, elk, peregrine falcons, even the rare and elusive rubber boa snake. Our friends and neighbors rely on the clean water that emerges from the Gulch to feed their cattle and irrigate their hay. The hidden ice caves and springs we've visited for generations and now share with our guests from around the country are still there but will literally be destroyed if a major mine and associated roads are developed.

Photo: Remnants of the B-47E bomber on Emigrant Peak.

Our businesses, homes, way of life and the memorial dedicated to the 1962 B-47E bomber crew and even the hallowed ground of the crash site itself are all threatened by inappropriate, large-scale gold mining in or around Emigrant Gulch.

For these reasons our family supports the Yellowstone Gateway Protection Act, S.941 as a straightforward and efficient means to protect this very special place for generations to come.

Respectfully Submitted,

/s/ Bryan Wells

Bryan Wells, Sally Wells & family
31 Emigrant Creek Road
Pray, MT 59065

August 3, 2017

The Honorable Lisa Murkowski
Chair, Senate Energy and Natural Resources Committee
522 Hart Senate Office Building
Washington, DC 20510

The Honorable Maria Cantwell
Ranking Member, Senate Energy and Natural Resources Committee
511 Hart Senate Office Building
Washington, DC 20510

The Honorable Mike Lee
Chair, Subcommittee on Public Lands, Forests, and Mining
361A Russell Senate Office Building
Washington, D.C. 20510

The Honorable Ron Wyden
Ranking Member, Subcommittee on Public Lands, Forests, and Mining
221 Dirksen Senate Office Building
Washington, DC 20510

RE: Support for S. 1548, the Oregon Wildlands Bill

Honorable Members of the Committee,

We are businesses that depend upon the ecological, social and economic values of the Rogue River. As you know, the Rogue River is a nationally recognized natural treasure and is one of the central engines of the tourism and recreation economy in Southern Oregon – an economy that continues to grow and provide sustainable long-term jobs and opportunities. We believe this unique landscape should be managed and protected to preserve these values for current and future generations.

We support Senator Wyden and Senator Merkley's efforts to protect the Lower Rogue River. Most recently, the U.S. Congress introduced S. 1548, the Oregon Wildlands Bill. Legislation to protect the Lower Rogue River has been introduced into every Congress since 2008, but the Congress has failed to pass any meaningful protections for this world-class river and Oregon treasure.

With the endorsement of a wide range of interests, including nearly 100 businesses and river conservation organizations, protection for the Lower Rogue River is long overdue. Please work to pass this bill so that the Wild Rogue can continue to serve as the playground for local river enthusiasts and attract tourists from all over the world.

The Wild Rogue River canyon is one of the most remote, unspoiled, and pristine landscapes in the West – while remaining accessible to users of almost any age and skill level; this wild character, use, and enjoyment should be preserved for future generations. The Wild Rogue Outfitters Association supports S. 1548 and the Oregon Wildlands Bill.

Sincerely,

Erik Weiseth, President
Wild Rogue Outfitters Association
Owner, Orange Torpedo Raft Trips

Pete Wallstrom, Owner
Momentum River Expeditions

Zach Collier, Owner
Northwest Rafting Company

Tyler Wendt, Owner
OARS Rafting

Will Volpert, Owner
Rogue River Journeys

Taylor Buchanan, Manager
Morrison's Rogue Wilderness Adventures

July 25, 2017

The Honorable Mike Lee, Chairman
Subcommittee on Public Lands, Forests, & Mining
361A Russell Senate Office Building
United States Senate
Washington D.C. 20510

The Honorable Ron Wyden, Ranking Member
Subcommittee on Public Lands, Forests, & Mining
221 Dirksen Senate Office Building
United States Senate
Washington D.C. 20510

Dear Chairman Lee and Ranking Member Wyden,

The Wilderness Society (TWS) writes to express views on the legislation being heard tomorrow in the Subcommittee on Public Lands, Forests and Mining and we respectfully request that this letter be included in the July 26, 2017 hearing record for the Subcommittee.

The Wilderness Society (TWS) enthusiastically supports **S. 941**, the Yellowstone Gateway Protection Act introduced by Senator Jon Tester of Montana. The 30,000 acres of Custer Gallatin National Forest addressed in this bill are of national significance and passage of S.941 would benefit many Americans from all walks of life as well as future generations. This bill is brief and to the point: It would make permanent the current Administrative, two-year withdrawal of federally owned minerals on the same 30,000 public acres just north of Yellowstone National Park. It respects private property rights and does not affect already established mining claims in the withdrawal area.

Park County and the surrounding Yellowstone Gateway communities are thriving in no small part due to the natural amenities, healthy ecosystems, and outdoor recreation opportunities provided here. It is for this reason a coalition of 360 area businesses formed the Yellowstone Gateway Business Coalition to ensure that new mining proposals don't degrade the Yellowstone River and the beautiful landscapes that draw millions of vacationers, hunters, anglers and hikers to Yellowstone's northern gateway. Formal support has come from local businesses, civic groups, the Gardiner Chamber of Commerce, Park County Commission, sportsmen and conservation groups, and others. Interior Secretary Ryan Zinke endorsed protection of this area from new mining last summer while running for re-election to the U.S. House. He reiterated his support after being nominated to lead the Interior Department.

We stand with local leaders across the political spectrum who are united in their efforts and agree that Yellowstone is "more valuable than gold" and that S. 941's permanent withdrawal of this area from new mining claims is a needed step to protect the growing outdoor economy, exceptional wildlife and water, and recreation assets of this area at the gateway to Yellowstone National Park. We urge swift passage of S. 941 without amendment.

TWS strongly opposes **S. 468**, the Historic Route Preservation Act, as introduced and urge you to prevent its advancement. Revised Statute 2477, commonly referred to as "RS 2477," is a provision in an 1866

mining law intended to facilitate the transportation of goods and people across federal public lands and promote the orderly settlement of the West. We have a keen understanding of Revised Statute (RS) 2477 and the history of this law. RS 2477 granted rights-of-ways for "the construction of highways across public lands not otherwise reserved for public uses." Importantly, the Federal Land Policy and Management Act of 1976 (FLPMA) repealed the RS 2477 provision and established an updated process for determining reasonable access to federal lands, with public participation in the decision-making process and long-term, sustainable management goals for these public areas. This process was the remedy to replace the sometimes haphazardly applied RS 2477 regime. It provides for the grant of rights-of-way to applicants using a more clearly-defined, sensible process that reflects a more modern approach to resource management.

Today, more than 40 years later, RS 2477 has been resurrected to promote unrestricted development and road construction that often harms our federal public lands. While there are still valid claims of highways that were constructed to help settle the West, the law is being abused to allow for anyone to claim a property right over public lands with little or no evidence that such a right-of-way existed and was used by the public prior to 1976 (or the date that the land was reserved, whichever was earlier). Further, while the courts have jurisdiction to review the validity and scope of R.S. 2477 claims, S. 468 provides an administrative process that will facilitate fraudulent claims that conflict with both the original intent of RS 2477 and the intent behind its repeal in 1976.

S. 468 would extend the current 12-year statute of limitations under the Quiet Title Act by giving an expanded category of claimants a full 25 years to apply for R.S. 2477 rights. And then, in what would amount to a giveaway of federal property, the bill would give the Interior Department just 120 days to make a decision or the R.S. 2477 claim would be deemed valid. S. 468 will lead to a crescendo of more conflict of users of public land, visitors, adjacent private landowners, and local business owners who rely on a fair and transparent land management process. This will negatively impact hunters, anglers, mountain bikers, hikers, snowsports enthusiasts, equestrians and birders along with numerous other recreationists and public land stakeholders.

The Wilderness Society opposes **S. 467**, the Mohave County Federal Land Management Act. The bill would direct the BLM to conduct sales of not less than 6,000 acres (and potential tens of thousands of acres) of public lands identified for potential disposal in the Kingman Resource Area Resource Management Plan, Lake Havasu Field Office Resource Management Plan, and Arizona Strip Field Office Resource Management Plan, as jointly selected by Mohave County and the BLM. The lands identified in these plans were identified for "potential disposal", in some cases more than 25 years ago.

As the BLM has previously testified, "[t]he process of identifying lands as potentially available for disposal typically does not include the clearance of impediments to disposal such as the presence of threatened and endangered (T&E) species, cultural or historic resources, mining claims, oil and gas leases, rights-of-way and grazing permits. Also not included in this identification process is an appraisal of values or a specific survey of the lands. Furthermore, because land use plans typically extend over many years, lands identified as potentially available for disposal at one point in time may be found later to be unsuitable as a result of subsequent changes, such as oil and gas leasing, listing of T&E species, and establishment of extensive rights-of-way or other encumbrances. For this reason, the BLM normally conducts site-specific NEPA analysis prior to disposal of a particular tract or tracts of public land. The Department uses the NEPA process to provide opportunities to consider environmental impacts, public engagement, and mitigation opportunities, as well as to ensure that unknown or unforeseen issues are

not overlooked. Failure to use the land planning process, and the associated NEPA review, can result in a failure to provide relevant and useful information to the public and the BLM decision makers."

By mandating the BLM to sell the public lands described in the legislation, S. 467 ignores the potential legal and policy conflicts, public engagement, and alternative conveyance options that the BLM is legally required to consider before deciding whether to sell public lands identified for potential disposal in a Resource Management Plan. While TWS does not oppose appropriate sales of public lands conducted in accordance with applicable law and the public interest, S. 467 circumvents an array of laws and policies that ensure the public interest is considered and served.

We also note that there are many opportunities for acquisition of inholdings and other priority parcels within the state, and conveying particular parcels of BLM land may better serve the public interest through exchange, rather than sale. TWS urges the Committee to reauthorize the Federal Land Transaction Facilitation Act, which provides a more efficient means of addressing any potentially legitimate conveyance concerns raised by S. 467, while also providing authority to better serve the public's keen interest in our public lands.

TWS opposes the Alaska Native Veterans Land Allotment Equity Act, **S. 785.** This bill could create thousands of private inholdings across Alaska's public lands, including within national forests, fish and wildlife refuges, and even congressionally designated wilderness areas. It would reopen the Alaska land entitlement process, disrupt precedent under existing law, allow Native Corporations new access to privatizing Alaska's public lands, and undermine the goal of finalizing land entitlements in the state, all while using inequitable means. We urge you to reject this legislation.

In 1971, Congress sunset a land allotment program as a component of the passage of the Alaska Native Claims Settlement Act. At the time, some Alaska Natives were stationed overseas in Vietnam, and they missed their final window to select an allotment. To correct for this, Congress created a new 18-month window in 1998, and amended it in 2000, so that affected Alaska Native Vietnam Veterans could select allotments. 700 applicants applied for 991 parcels of land through the 2000 reopener. Instead of truly resolving this issue for the original discrete class of veterans, however, S.785/H.R. 1867 unnecessarily opens up a completely new land entitlement program and, in doing so, puts thousands of acres of sensitive lands at risk with very little safeguards.

In summary, this legislation is the wrong approach toward correcting for the missed opportunity that certain Alaska Native Vietnam Veterans faced as a result of their military service. In doing so, it creates an entirely new set of inequities among veterans and Alaska Natives alike, while threatening to hastily carve up intact public lands across the state of Alaska.

Regarding **S. 837**, the Southern Utah Open OHV Areas Act, TWS believes that a public purpose conveyance, consistent with the Recreation and Public Purposes Act for certain public land in Washington County that is currently managed by the BLM as an Open OHV play area may be appropriate. Intense OHV use on certain lands in the area has significantly affected the value of those public lands for other public uses, and the County might be appropriately positioned to manage those lands for continued public OHV recreation into the future. However, it is unclear why the land exchange directed by the bill is necessary or consistent with the public interest, given that the exchange appears to merely insert the BLM as an unnecessary "middle man" into a land transaction between SITLA and the County. Indeed, it appears that the only role the BLM serves in the exchange is to direct the use public

land in lieu of an appropriations earmark to cover the County's costs of acquisition. Given that the BLM, and thereby the American public, would shoulder significant costs associated with its role as a temporary conduit between SITLA and the County, it seems that the land exchange is not in the public interest.

Thank you for considering our views on these bills.

Sincerely,

Drew McConnville
Senior Managing Director for Government Relations
The Wilderness Society

July 21st, 2017

Please Support S.941, The Yellowstone Gateway Protection Act.

Dear Members of the Senate Energy and Natural Resources Committee:

The Yellowstone Gateway Business Coalition (YGBC) is a group of regional businesses and landowners who have united to protect the gateway to Yellowstone from industrial-scale gold mining. On behalf of our more than 350 members, we write to **urge you to support S.941**, "The Yellowstone Gateway Protection Act." Our community and our thriving economy is threated by two proposed industrial-scale gold mines in Park County, Montana—the northern gateway to Yellowstone National Park. The proposed legislation would permanently withdrawal federal mineral rights on 30,000 acres of public lands adjacent to the world's first national park.

Park County is home to a flourishing economy that is fueled by on our world-class natural amenities which would be protected through the proposed legislation. Yellowstone National Park, our public lands, the Yellowstone River, our abundant wildlife, and our mountain peaks draw visitors from across the globe—and these visitors in turn drive the local economy through recreation and tourism.

- In 2014, the more than 3.5 million tourists who visited Yellowstone spent an average of $196 million in Park County and contributed to the creation and support of nearly 3,000 jobs.
- The proposed mines threaten our world famous waterways which produce $70 million a year in direct spending from the fishing industry alone.

Park County is also home to thriving and diverse businesses such as fishing and hunting outfitters, ranchers, technology entrepreneurs, and much more. Business owners choose to begin their businesses in our community in large part due to the natural amenities. Studies have indicated our economic health and stability comes from capitalizing on three attributes of our region:

- *A high proportion of persons employed in creative occupations*. Park County ranks in the top 6% among more than 2,000 non-metro counties nationally for creative class employment.
- *Highly ranked area amenities and recreational resources*. There is no question that our natural amenities drive our economy.
- *A strong setting for entrepreneurial initiative*. Proprietor or self-employment represents a significant portion of employment in Park County, accounting for 39% of all jobs in 2014.

The proposed industrial-scale gold mines would devastate our businesses that depend on the Paradise Valley's pristine resources. Mining impacts, including loss of public access, impacts to local roads and services, noise and air pollution, and the acid-producing tailings left behind, will permanently compromise the health of our community.

As members of the YGBC, we don't have to agree on everything to agree that Yellowstone is more valuable than gold. For the hundreds of businesses that have joined the YGBC, and the thousands of individuals our businesses support, this is not a political issue—it is a community issue, an economic issue, and a quality-of-life issue.

We urge Senator Daines and the members of the Senate Energy and Natural Resources Committee to put Montana's local economies first by supporting S.941. We need this bill to safeguard our businesses, our families, and our community. For these reasons, **we urge you to support this bill**.

Sincerely,

Karrie Kahle,
Community Director
Yellowstone Gateway Business Coalition

Please accept into the record the following reports and letters:

- Park County Commission Letter.
- Yellowstone Gateway Business Coalition Membership List as of July 17, 2017.
- Swanson, L., April 2016. Key Trends, Dependencies, Strengths and Vulnerabilities in Park County, Montana, and its Area Economy. April 2015. O'Connor Center for the Rocky Mountain West at the University of Montana, Missoula.
- "Park County's Growing Economy. Southwest Montana region uniquely positioned for continued economic success." Published by the Yellowstone Gateway Business Coalition.

THE YELLOWSTONE GATEWAY BUSINESS COALITION is a group of hundreds of businesses and landowners throughout Paradise Valley, Gardiner, Livingston and southwest Montana who have joined together to protect our existing local economy from two proposed gold mines on the doorstep of Yellowstone National Park. Yellowstone Gateway Business Coalition is a pro-business, pro-property rights group representing thousands of hardworking employees and their families. While not anti-mining, we recognize not all mining is created equal. Our gateway communities — surrounding Yellowstone — are no place for gold mines.

February 14, 2017

Mary Erickson, Supervisor
Custer Gallatin National Forest
P.O. Box 130
10 East Babcock Avenue
Bozeman, MT 59771

The Park County Board of Commissioners submits these comments to inform and support the proposed permanent withdrawal from mineral development of certain federal lands in the areas of Emigrant Gulch and Crevice Mountain in Park County, Montana.

Park County derives significant economic benefit from nearby, intact federal public lands. These benefits include sustainable and high quality supplies of water for agriculture and other industries, significant tourism revenues, and economic growth associated with residential real estate development. The large-scale development of mineral resources in Park County has the potential to negatively impact natural resources, both during the life of the development and over the long term. The county's agricultural economy is dependent upon water quality and quantity, both of which are put at potentially permanent risk by large scale mineral development. Recreational fishing, hunting, hiking, skiing, mountain biking, and other activities are also significant sources of local tourism income, and the existence of those opportunities is a significant contributor to Park County's attractiveness to current and prospective residents, both those currently in the work force, and those who bring retirement and investment income to the county's economy. A reduction or degradation of the county's recreational opportunities would negatively affect the local economy, resulting in long term stresses to public finances.

The Board of Commissioners understands that development of federal mineral rights would have the potential to generate additional property tax revenues, which would benefit Park County government. Offsetting this benefit would be higher county public works expenditures resulting from increased use of county roads and bridges, both in the immediate vicinity of mining operations and throughout the county, and from increased demands on public safety resources and emergency services related to traffic and industrial activity associated with those operations. County government would also experience increased demands for public health and other services associated with population increases, both direct and indirect, due to in-migration of mine employees and their families.

The Board of Commissioners also has concerns relating to the socioeconomic effects of large-scale federal mineral development. Large-scale resource development in similar small community settings in the western United States has historically resulted in increased demands on schools, infrastructure, and recreational resources, with the costs of accommodating those demands not fully offset by the economic stimulus provided by that development. Further, large scale mineral development has the potential to reduce economic diversity in areas affected by that development, reducing economic resilience, creating exposure to volatile commodity price cycles, and increasing the risk profile of public finance revenues.

414 East Callender Street | Livingston, Montana 59047 | t: 406.222.4106 | f: 406.222.4160 | www.parkcounty.org

PARK COUNTY COMMISSION
MONTANA

The development of a major industrial project such as a large mining operation would also be a significant source of market pressure on the county's supply of lower- to mid-price residential real estate, exacerbating the county's existing shortage of affordable housing, and potentially forcing some existing residents, particularly those in rental housing, to relocate. Offsetting this increase in lower- to mid-range housing prices, the presence of large-scale mining has the potential to suppress future high-value real estate development, particularly the development of second homes and retirement properties. If the net effect is an overall reduction in the value of existing property, or a reduction in future tax base growth, this would affect public finance revenues both directly, through reduced tax assessments, and indirectly, through a reduction of the growth of economic activity resulting from lower growth in personal net wealth.

The limited life of individual mineral development projects, and the limited time horizon of associated increases to public finance revenues, has the potential to depress local economic conditions upon the conclusion of mineral production. In particular, the ultimate closure of large mining projects often leads to permanent reductions to industrial and residential property tax revenues, reduced housing demand and values, and declining activity for local businesses. These factors create long-term stresses to public finances and generate difficulties in funding maintenance of public infrastructure that was developed in association with those projects.

The Park County Board of Commissioners recognizes that there are potentially both economic benefits and costs associated with the withdrawal of federal public lands in Park County from mineral development. On balance, however, the Commission believes that the permanent withdrawal of federal lands from mineral development at Emigrant Gulch and Crevice Mountain will support the diversity and resilience of the county's economy while respecting private property rights, and will preserve public lands in their unimpaired state, ensuring the long-term viability of public finance revenues and providing sustainable benefits to the local community and its economy over the long term.

Steve Caldwell
Chairman

Clint Tinsley
Commissioner

Bill Berg
Commissioner

414 East Callender Street | Livingston, Montana 59047 | t: 406.222.4106 | f: 406.222.4160 | www.parkcounty.org

Yellowstone Gateway Business Coalition

358 members as of July 17, 2017

2nd Street Bistro
3 Bears Media
360 Ranch
45 North Films
5060 Properties, LLC
7 Point Ranch
A Naturalist's World
A Stone's Throw Bed and Breakfast
Absaroka Dogsled Treks
Absaroka Lodge
Absaroka Realty Inc
Addicott Enterprises LLC
Alara Jewelry
Alpen Reel Co
Alpine Maintenance
Alpine Vista Suri Alpacas LLC
Altitude Gallery
Altitude Sports, LLC
AM ArborCare LLC
Ambroisa Catering
American Fly Fishing Trade Association
American Sportfishing Association
AMTI Aviation Group
Amy Petrulis Counseling Services
Anderson Ranch
Angler's Haven
Angler's West Flyfishing Outfitters
Arrowhead Pest Management
At Home On The Range
Autopilot Inc.
B & G River Shuttle
B4 Ranch
Bangtail Bikes & XC Skis
Banovich Art Center
beSpoke Communications
bgConstructions
Big Sky Moonrise, LLC
Big Sky Mountain Products
Big Sky Rod Box, LLC
Big Wild Adventures, Inc.
Biophilic Solutions LLC
BioPics Productions

Blackbird Kitchen
Blanchford Landscape Group
Blue Bean Coffee Roasters
Blue Ribbon Sales
Bodner Chandeliers
Bozeman Center for the Healing Arts, Inc
Bozeman Creative
Bozeman Family Fly Shop
Bozeman Fly Outfitters, LLC
Bozeman Tropical Sno
Brant Oswald Fly Fishing Services
Brechbuhler Architects
Brick Bound
Brickhouse Creative
Bridger Brewing Company
Brook Fishing Equipment
Brotaje
Buchanan Expressions
Bud Lilly's Trout Shop
Bullion Bench Homeowners Association
Bumpercrop Films LLC
Business for Montana's Outdoors
Cactus Blossom Collective
Camel Discovery
Campbell Counseling
Chadz Coffee Shop
Charles Bolte Photography
Chico Day Spa
Chico Hot Springs Resort
Coffee Crossing
Conley's Books & Music
CoolWorks.com
Corporate Niche, LLC
Costa Sunglasses
Country Bookshelf
CPJs
Crevice Mountain Lodge
CTA Inc.
Cutthroat Catering (Pinkys)
Damsel Fly Fishing
Dan Bailey Fly Shop
Dancer Guide Service LLC
Dean's Zesty Booch
Decker Music Service
DeYoung Studio
Dickens, Inc.
Dodge Guides
Double H Consulting
ECHO Fly Rods
Eight Mile Ranch
Electric Gecko Inovations
Elichai Fine Jewelry
Elk River Books
Emigrant Cabins LLC
Emigrant Creek Cabins
Emigrant Guest House
EnviroWise Design
Eric Ian Photography, LLC
Erik Petersen Photography
Erotique, LLC
Eubank Creative, Inc.
Eyecare Professionals
Fayes Cafe
Feed Cafe

Fermentana, LLC
Firehole Prop Inc
Fishing Outfitters Association of Montana
Fishpond, Inc.
Flora Fauna Designs
Flying Pig Raft Company
Follow Yer' Nose BBQ
Geyser Whitewater Expeditions
Gil's Goods
GoodWorks Development
Grand Teton Fly Fishing
Granite Peak Publications
Granny's Gourmet Donuts
Greater Yellowstone Guides
Green Acres Lodge
Green Seams Designs
Grizzly Creek Films
Guardian Title
Headroom Corporation
Headwaters Guide Service
Hells A-Roarin' Outfitter
Heritage Ranch LLC
Highline Partners LTD
Homefire Productions
IgniteFeedback
Indepaints, Inc.
Iron Horse Bar & Grille
Irons Limited
Jackson Hole EcoTour Adventures
Jess McGlothlin Media
Jim Evanoff Consulting
JM Brand Management
Johnstad's B&B & Log Cabin LLC
Jonathan Foote Architect
Joshua Mills, LLC
Jumping Off Point
JZphotoArt
K- Bar
Kare Solutions
Karen Reinhart - Author
Katabatic Brewing
KPotter Fine Arts, LLC
Landis Wildlife Films
Last Frontier Strategies
Leadership Outfitters
Legacy Ranch
Lehrkind Mansion B&B
Livingston Bodega
Livingston Kite Company
Livingston Knitter
Lohss Construction
Lone Cactus Ranch
LTS Architects
Luna Properties LLC
Lynn Donaldson Photography
Madison-Gallatin Trout Unlimited
MAP Brewing
Markoutre
Marks In and Out
Massive Studios
McLaughlin Human Performance Institute
Medicine Lake Outfitters
Mercury CSC
Meyers Group Inc

Montana Alpine Adventures--Bell Lake Yurt
Montana Alpine Guides
Montana Angler Fly Fishing
Montana Farrier Supplies
Montana Fly Fishing Guides, LLC
Montana Homestead Cabins
Montana Hunting Company
Montana Quarterly
Montana Reclaimed Lumber Co.
Montana Troutfitters
Montana Whitewater Rafting and Zipline
Mordam Art
Morleys Acres Farm and Bed & Breakfast
Morning Glory Coffee & Tea
Mountain Home Vacation Rentals
Mountain Sanctuary
Mountain Sky Guest Ranch
MountainWorks Software Inc
Murray Bar
Mustang Fresh Food and Catering
Neptune's Brewery
Newhall Studio
Nickerson Ranch
North Wallace Design Guild
North Yellowstone Hostel
Northern Lights Trading Company
Northfork Financial
Nova Cafe
Oasis Properties, LLC
Oboz Footwear
Off the Beaten Path
Old Chico Enterprises Inc.
OLT Trucking LLC
OM Studio
On Site Management, Inc.
OnSite Energy Inc.
Oracle
Organic Lawn LLC
Orvis
Osborn Gallery
Out of the Blue
Out of the Woods Fine Woodworking
Outside Bozeman
Paper Airplane Designs
Paradise Adventure Company
Paradise Gateway B&B
Paradise Valley Estates
Paradise Valley Greens
Paradise Valley Shirt Company
Park and Life Magazine
Park County Chiropractic
Park Photography
Parks Fly Shop
Parks Reece Gallery
Peak Films
Pegasus Copters
PhD Skis
Pine Creek Lodge
Pinky’s Café
Plazby, LLC
Plonk
Pray Cafe
PrintingForLess.com
Pronto!

pulseCHECKER

Quenby & The West of Wayland Band

Querencia Lodge

Quesenberry Insurance Agency

Raich Montana Properties

Ranch and Resort Group

Ranger Mark's Retreat

Rate Law Office, p.c.

Rathvinden Farm

Redington

Rick Lamplugh Author/Publisher

Ridgeway Milling & Custom Wood

Riley Ranch

RIO Products

Rip n' Lip Guide Service

Rivers Bend Lodge & Reed Fly Farm

Riverside Cottages

Rock Dog Art

Rockin HK Hiking

Rocking CB Ranch

Rocking T Ranch LLC

Ronald Judkins Building

Rubber Ducky River Rentals

Sabin Metal

Sage Fly Fishing

Sandra Lee Photography

Seneca Boards

Shifley Enterprises

Shining Mountain Gallery

Shining Mountain Lodge

SIMMS Fishing Products

SiteOne Therapeutics

Sitka Gear

Skyblasters

Slainte Mhatth Inc.

Small Dog Realty

Sola Cafe

Soundcolor Studios Inc.

Souvigney Consulting

Spannring Studio

Spectec/TIC

SUP Montana

Swan Woodworking Machinery

Sweetwater Fly Shop

Sweetwater Travel

Synergig Design

Tara's A Salon

Tart

The Bozeman Angler

The Bus Driver Tour

The Eagle Radio stations, 104.7-105.7 and K-SKY Country 106.9

The Frame Garden

The Gourmet Cellar

The Grabow

The Mountain Project

The Needle's Point

The Notorious P.I.G.

The Old Saloon

The Pop Stand

The River's Edge

The River's Edge West

The UPS Store Livingston

The Wild Side Tours

ThinkBody Design
Thomas Endurance Coaching
Three Peaks Ranch
Timber Trails Outdoor Store
Timbercraft Inc.
Tink
TravelingMel.com
Tributaries Digital Cinema
Trimbach Builders, LLC
Trinity Massage LLC
Triple Peak Ranch
Trout Chasers Lodge & Fly Fishing Outfitters
Tumbleweed Bookstore and Cafe
Un-Knotted
Uncorked Wine and Cheese Bar
UZ Works
Vagabond Deli
Vision Aerial, LLC
Vootie Productions INC.
Wee Stitchery
Welch Enterprises
Westlands
Westscape Wholesale Nursery
Wheatgrass Saloon
Wild Bear Adventures
Wild Joe's Coffee Spot
Wild Poppy Beauty Bar
Wild Things Unlimited, Inc.
Wild Trout Outfitters
Wild West Clothing
Wilder Goods
Wildflour Bakery
Williams Therapeutic Massage
Wisetail
Woods Rose Market
Xanterra Parks & Resorts
Yellow Dog Flyfishing Adventures
Yellowstone Angler
Yellowstone Basin Inn
Yellowstone Country B&B
Yellowstone Fly Fishing School
Yellowstone Grassfed Beef
Yellowstone Guidelines
Yellowstone House
Yellowstone Insight
Yellowstone Physical Therapy
Yellowstone Preserve Ranch
Yellowstone Raft Company
Yellowstone River Guides
Yellowstone River Motel
Yellowstone Safari Company
Yellowstone Ski Tours
Yellowstone Sky Photography
Yellowstone Valley Lodge
Yellowstone Wild the Gallery
Yeti Printing And Embroidery
Yostmark Mountain Equipment
YouBiq.com
Zilz Productions
Zondra Skertich Licensed Massage Therapist

Key Trends, Dependencies, Strengths and Vulnerabilities in Park County, Montana, and its Area Economy

By Dr. Larry Swanson, Ph.D. Economist*

April, 2016

Overview

This report examines the area economy of Park County, Montana, and important trends and factors in area population and economic growth and change. Underlying characteristics of the economy are examined, as well as area economic dependencies, strengths, and vulnerabilities. This study builds from an earlier, comprehensive study of the larger region in and around Yellowstone National Park, which included Park County and 24 other counties in a three-state region. This study was done in 2007 for the Yellowstone Business Partnership.[1] The study found that most of the region was growing and advancing economically and attributed this economic success to the growing importance of area amenities and quality of life, assets that the area and region are unequivocally endowed with, and asserted:

Most of the region's smaller cities and towns are seeing population growth, with more and more people drawn to the region's high quality environment. As in many other areas of the Interior Mountain West, the Yellowstone Region is growing because more people want to live in attractive areas with big natural landscapes, towering mountains with healthy forests and grasslands, large wildlife populations, plentiful outdoor and recreational opportunities, and attractive and welcoming communities. [...]

The key question for the future will be: "How can the region's businesses and communities grow and prosper, while simultaneously protecting and enhancing the region's chief economic asset – its high quality environment? [2007 YBP report, p. 1]

This more recent report and follow-up focuses only on Park County, Montana, and includes more current data and information on population growth, area aging, housing and construction, traffic counts and trends, visitation to Yellowstone National Park, visits to the area by hunters and anglers, tourist and recreationist expenditures, area income and employment, industry or sector growth and change, and area economic well-being.

By almost any measure the Park County area economy is growing and area prosperity is being sustained and enhanced over time. The personal income base of the county recently reached an all-time high of $645 million, measured in inflation-adjusted dollars. Per capita income also reached an all-time high of nearly $41,000 which compares with a level state-wide of $39,900. Area poverty also is considerably lower than the state-wide average.

The area's labor force continues to grow, as does area employment. The area economy is steadily recovering from the effects of the recent national recession and the area unemployment rate is likely to fall to as low as two percent by the summer of 2017. The county also has a relatively high percentage of self-employment, which is oftentimes used as an indicator of the area's entrepreneurial context. And, because of the area's attractiveness and quality of life, considerably more labor earnings are imported into the county from county residents working outside of Park County who continue to live in the county, with these imported labor earnings now accounting for 25 percent of all labor income received by county residents.

Much of Park County's population growth over recent decades has been from positive net migration, that is, from more people moving to the area than the number moving away. Many

rural or non-metro counties across the U.S. do not share in this positive net migration and are seeing population stagnation and decline because of it. Longstanding net migration to Park County clearly indicates the area has outstanding features that continue to attract new residents as well as part-timers, while also retaining residents as they retiree. Area amenities will become an even bigger factor in future growth as the population continues to age, births rates fall and death rates rise, with almost all future population growth tied to migration. Park County should continue to fair well in the exchange between inflows and outflows of residents and in attracting visitors to the area. Rural areas without quality amenities like those of Park County will not fair so well.

Area amenities help to grow and sustain the area economy in wide-ranging ways – by contributing to a stable and growing population and to a growing number of visitors and part-timers who travel to and spend time in the area. New residents and a growing number of recreationists and other visitors spend money on a wide range of goods and services offered by area businesses. New residents and part-timers add to area construction and real estate activity by the homes that they buy or build and by the business expansion their spending helps support. What brings a growing number of part-timers to Park County are the area's obvious high quality of life and area amenities. The very heart-beat of the Park County economy reflects the ebb and flow of visitors and travelers to the area each year with considerably more economic activity and employment in the summer months than in the winter.

Area amenities and quality of life also have been shown to be crucial in helping to attract a growing number of workers to particular areas who work in occupations that require "creative" types of skills and talents, which are increasingly valued in today's information and knowledge based economy. Economists with the U.S. Department of Agriculture's Economic Research Service (ERS) have developed measures of the extent of area employment in an array of creative occupations. There are 3,141 counties and county equivalents in the U.S. and 2,051 of these are non-metro counties like Park. In the ERS measure of area creative occupation employment, Park ranked 120th among all 2,051 non-metro counties or in the top six percent of these counties. ERS studies further show that many non-metropolitan counties that tend to be high in these measures of creative employment also are ones ranked very high in terms of area amenities and area recreation resources and attributes.

ERS studies indicate that counties having three attributes tend to rank highest in terms of population and employment growth and overall rural development potential and these are: 1) a relatively high proportion of persons employed in "creative" occupations, 2) a seemingly strong setting for entrepreneurial initiative, in part, indicated by an area's high level of self-employment, and 3) relatively highly ranked area amenities and recreational resources.[2] These three attributes are referred to by economists as the "trifecta" for positive rural development and all appear to be core strengths of the Park County area economy.

The chief threat to area quality of life and economic well-being would be any future activities that negatively impact, both substantively and perceptually and on a large scale, area amenities and environmental attributes that have become the foundation of the area's economic vitality. Large-scale, highly visible, and environmentally disruptive activities, such as certain mining and heavy manufacturing activities, may pose the greatest threats. While these activities do bring jobs, employment earnings, and income to an area, these benefits are sometimes short-term or transitory while their negative impacts are deep, continuing sometimes in perpetuity, and causing long-term economic impairment.[3]

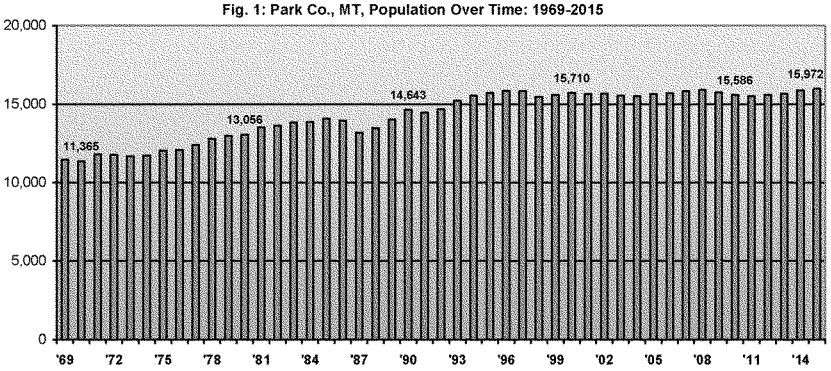
REPORT CONTENTS

Overview and Major Findings ..... p. 1
Park County Population Trends ..... p. 3
Natural Change vs. Net Migration ..... p. 7
Larger regional patterns of population growth and decline ..... p. 11
Natural Amenities and Area Economic Growth ..... p. 13
Area Housing Numbers and Growth ..... p. 16
Trends in Visitation to Yellowstone National Park ..... p. 21
Traffic Levels to and from the Park ..... p. 21
Non-resident Traveler Spending in Park County ..... p. 24
Area Labor Market Trends and Patterns ..... p. 25
Area Fishing and Hunting Activity ..... p. 27
Area Spending by Hunters and Anglers ..... p. 31
Private Membership Organization Investments in Land Stewardship ..... p. 32
Park County's Growing Area Economy ..... p. 33
Labor Earnings by County Residents from Workplaces Outside the County ..... p. 35
Growth in Area Per Capita Income ..... p. 36
Area Employment Growth ..... p. 37
Park County Employment by Major Sector ..... p. 38
Pre- and Post-Recession Employment Change by Major Sector ..... p. 39
Labor Earnings Trends in Sectors Affected by Travel and Tourism ..... p. 41
Pre- and Post-Recession Growth and Change in Area Labor Earnings ..... p. 45
Areas of Labor Income Decline during the Recent Recession ..... p. 47
Area Agriculture ..... p. 48
Summary of Findings and Conclusions ..... p. 51
End Notes ..... p. 56

Park County Population Trends

While the county has seen very little population growth in the last decade, it has a long history of gradual but steady growth and overall population stability. Figure 1 shows annual population counts for Park County each year since 1969. The county's population in 1970 was 11,365 (July 1 estimate). It grew to 13,056 by 1980 – an increase of 1,691 or 15 percent – and to 14,643 in 1990, adding another 1,587 residents. In the '90s the county's population rose another 1,067 or about 7 percent. The population peaked at 15,896 in 2008.

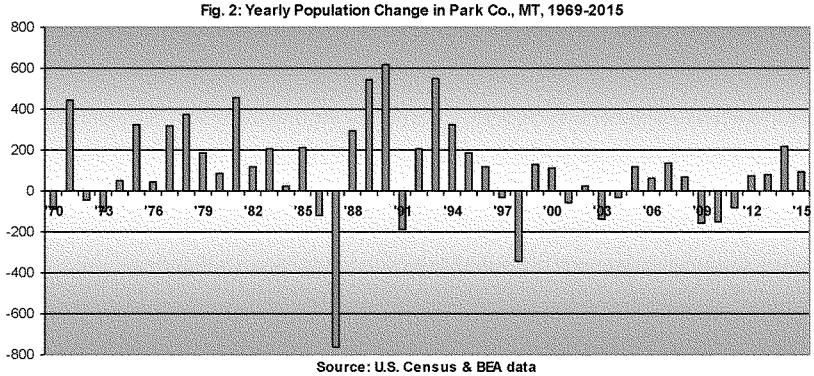
Fig. 1: Park Co., MT, Population Over Time: 1969-2015



Source: U.S. Census & BEA, U.S. Dept. of Commerce (July 1 counts)

Year-to-year population change by Park County is shown in the chart below (Figure 2). Years when significant population declines occurred tend to coincide with national economic recessions, such as in 1991, 2001, and, more recently, in 2009, 2010, and 2011. A very sharp decline in 1987 coincides with very difficult financial times in production agriculture and in the wood products sector, as well as in housing.

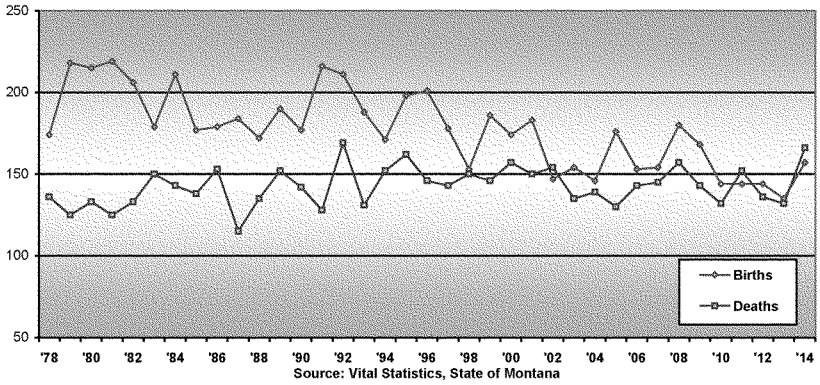
Fig. 2: Yearly Population Change in Park Co., MT, 1969-2015



Source: U.S. Census & BEA data

The recent nation-wide recession, beginning late in 2007 and continuing into 2010, altered population trends across the U.S., and had its greatest impacts on area housing, construction, real estate, and finance. Aside from these declines, the county's population has grown fairly steadily. This growth is now continuing and the county's population was recently estimated by the U.S. Census Bureau at 15,972 in July, 2015. Population growth occurs through both "natural change," or area births minus deaths for a given time period, and "net migration," or the number of people moving away from the area versus those moving to it, considering only those who change their county of permanent residence in the process. The chart below shows annual, calendar-year births and deaths involving Park County residents from the late '70s through 2013.

Fig. 3: Annual Births & Deaths by Park Co. Residents, 1978-2014

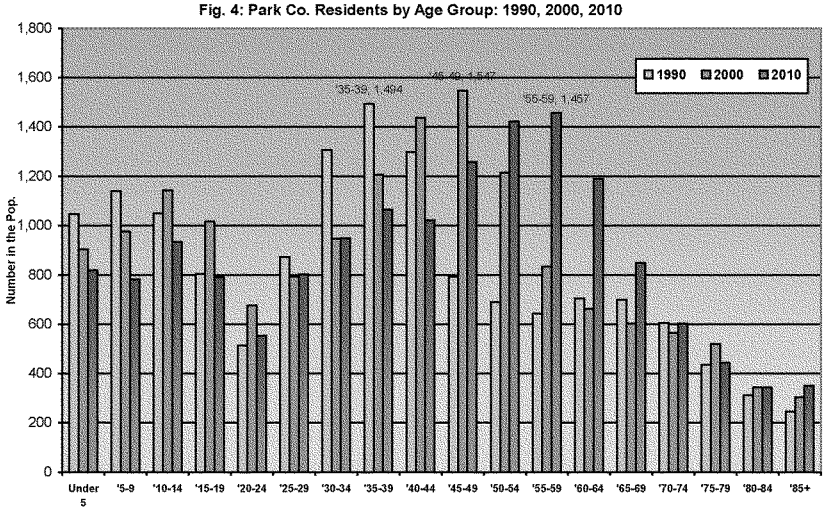


Source: Vital Statistics, State of Montana

Annual births are shown in green and deaths are in brown. In the past, births have almost always exceeded deaths in any given year. But, over time, birth numbers are trending downward, even though the population as a whole is growing, while the number of deaths each year among county residents is slowly trending upward. And in several recent years the number of deaths has exceeded births. This will increasingly become the norm for most of the next twenty years because of the gradual aging of the Park County population. As it does natural population change will become consistently negative from one year to the next, subtracting from the area's overall population. Nearly all area population growth over the next 15 to 20 years will be from net migration, assuming more new residents continue to move to the area than those moving away.

The way in which the area population is aging can be seen in Figure 4 which shows Park County's population in 1990, 2000, and 2010 by age group, from younger to older age groups, left to right in the chart.

Fig. 4: Park Co. Residents by Age Group: 1990, 2000, 2010



Source: Census Bureau data

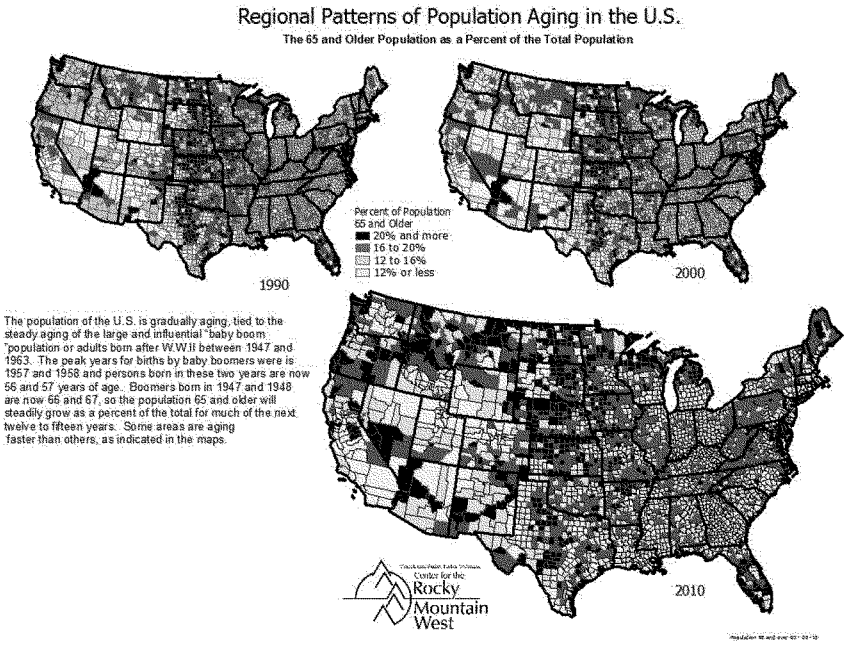
At the far left is the number of Park County residents under five years of age in each of these Census years and you can see how this number is steadily declining. The same is true for children 5 to 9 years of age. So the county's population of young children is declining. This is the result of having fewer young adults between 25 and 40 years of age in 2010 than the number in 1990, which you can also see in the chart. Meanwhile the number of residents at ages over 50 is growing steadily with time, particularly for adults 50 to 54, 55 to 59, and 60 to 64.

This shift in growth to older adults is largely because of aging "baby boomers," or persons born between 1948 and 1962. Because of large increases in births during these post W.W. II years, a "bulge" in the population was created. And as persons in this bulge continue to age, so does the population as a whole. In 1990 boomers were between 28 and 42 years of age, and you can see in the chart that the age groups with the largest numbers in 1990 are the two between 30 and 39 years of age. Ten years later at the time of the 2000 Census this shifted to those between 40 and

49. And ten years after that in 2010 the largest number of residents were 50 to 59 years of age. This means that when the 2020 Census is taken the largest number of county residents will be between 60 to 69 years of age. In 2030 this growth shifts further to persons 70 and older.

These age shifts are occurring not only in Park County, but across the nation as growth has shifted to older adults and this pattern of growth will continue through 2030, with the fastest aging in rural counties with declining populations. For the state of Montana as a whole, the share of the population 65 years of age and older has gone from 13.4 percent in 2000 to 14.8 percent in 2010. And under projections by the Census Bureau this share will rise to over 25 percent by 2030 when Baby Boomers born between 1948 and 1962 are between 68 and 82 years of age. The maps in Figure 5 on the next page show how this aging process is playing out in counties across the state, region, and nation as a whole.

Fig. 5:



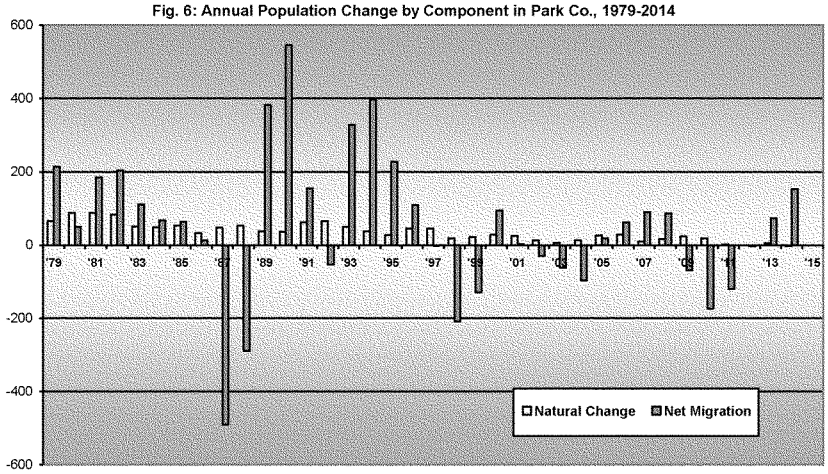
In Park County the 65 and older population was 14.9 percent of the total in 2000 and this rose to 16.6 percent in 2010 and will continue to rise. However, as the maps show, there are many other counties and areas where this aging is much more pronounced. In Montana the areas where this aging is greatest are the central and eastern portions of the state – rural counties and particularly rural counties with relatively high dependencies on agriculture.

Beyond Montana, there is pronounced or concentrated aging occurring in the northern, central, and southern Plains regions where area dependence on agriculture is high and where there are mainly rural, sparsely populated counties. But there are also many rural counties in western Montana and Idaho where the 65 and older populations already exceeds 20 percent of the totals. In the years ahead, population growth in most rural areas, if it is to occur, will be from positive net migration or more people moving to an area than the number moving away. How this plays out for any area will hinge upon that area's ability to retain current residents and to attract new residents, including young adults and retirees alike.

Natural Change vs. Net Migration

The data used in the charts above were adjusted to conform to time periods used in compiling the July 1 population estimates used by the Bureau of Economic Analysis (BEA) of the U.S. Dept. of Commerce. These were then used in constructing a data set to analyze year to year population change in Park County by major component – natural change versus net migration. These are used in constructing the chart in Figure 6. Yearly changes in net migration are shown in red and yearly natural changes (births minus deaths) are shown in green.

Fig. 6: Annual Population Change by Component in Park Co., 1979-2014



Source: Using Montana Vital Statistics births and deaths and annual population estimates (BEA) [reconciling differences in calendar year data and July 1 annual estimates]

The biggest driver of population growth in Park County by far is positive net migration (red bars). Again, net migration is positive when the number of people moving to the area is greater than the number moving away, counting only those who change their county of permanent residence in the process – which ignores part-time residents of the county who do not or have not become permanent residents. During the '90s when growth in the county was greatest, over seventy-five percent of this growth was accounted for by positive net migration. There was significant negative net migration in the late '80s, probably associated with a bad area economy when the area was far more dependent on agriculture and wood products. The pattern in more recent years is for ups and downs in net migration, reflecting a general economic slowdown, both regionally and

nationally, and sharp declines nationally in housing and related construction. Positive net migration has returned to Park County in more recent years as the economy recovers.

Park County's history of positive net migration has added significantly to the area's population over time. In the past this growth was supplemented by some growth from natural change. However, as aging continues and area deaths begin to consistently exceed births, any and all future population growth in the county will come from net positive migration. Whether or not this continues will hinge upon why people move to Park County in larger numbers than the number moving away. What makes this area an inviting and sustaining place to live for most of its residents?

Residents of an area, any area, are less likely to move away once they retire if they are comfortable with where they already live and enjoy the area quality of life. And for most retirees who are leaving the work force, all at once or gradually over time, area quality of life along with proximity to family and friends are dominant factors in where they choose to live.

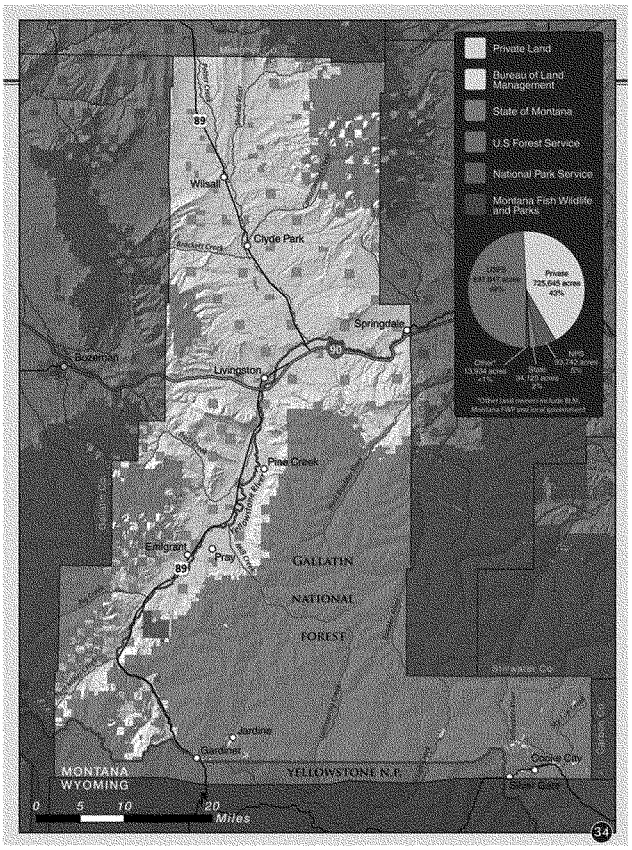
For younger adults, including those with children, area employment opportunities are important if not paramount. However, changes in the economy are making it easier for many younger adults to find jobs in areas where they want to live, not simply because of the availability of a job, but also because of the quality of life and area amenities. And as people make these choices about where they want to live, jobs often follow. In the past, people in their migration patterns largely followed where jobs were being created. But this isn't so simple today.

Young professionals and other kinds of workers tend to be more "footloose" in terms of where they can choose to live, and developments in information technology have greatly contributed to this. Many businesses also are becoming more footloose and can more freely choose where to locate, with many choosing attractive, less congested, rural locations for their offices. Rural areas throughout the region that are most likely to benefit from these trends and see stable if not growing populations and economies tend to be ones with certain attributes that factor heavily into location decision making, such as quality of life and area livability. Area recreational assets also are major factors in some of this location decision making. The mere presence of large amounts of public lands with large forests, plentiful streams and lakes, and mountains are increasingly being associated with and defined as "high amenity areas," and these are all glaring features of the Park County area.

The map in Figure 7 shows Park County and its surrounding area, focusing on the ownership of land, and is taken from The Atlas of Park County. The map shows area national public lands, including portions of Yellowstone National Park (YNP) to the south, and area federal forest lands managed by the U.S. Forest Service. U.S. Forest Service lands total more than 837 thousand acres and 49 percent of Park County's land area and a large portion of these federal forest lands are designated and managed as "wilderness areas." Lands within YNP that are in Park County total almost 94 thousand acres or about five percent of the county land area along the county's southern edge. The county also has some Bureau of Land Management (BLM) lands.

Lands owned by the State of Montana total about 34 thousand acres and there are other state lands managed by Montana Fish, Wildlife and Parks. Privately owned lands are shown with white backgrounds and these total 725,645 acres, which is about 43 percent of the county land total. Park County is about 2,800 square miles in size with about 1,500 square miles of this total containing some type of federal forest lands. This is 54 percent of the county's total land area and over half of these lands are federally-designated and protected "wilderness" areas.

Fig. 7: The Park County, MT, Surrounding Area and National Park and Federal Forest Lands



Source: Atlas of Park County Montana, 2013, land ownership map, p. 34

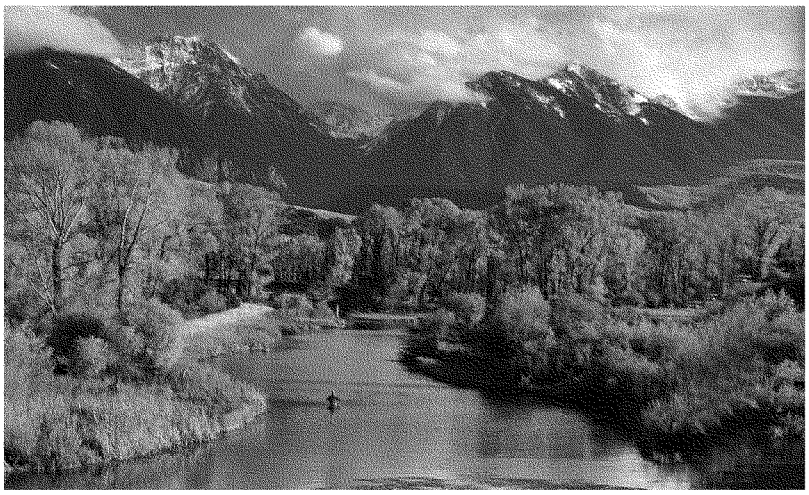
The area's largest city, Bozeman, in Gallatin County, is located about 25 miles west of Livingston, Park County's largest city, on Interstate 90 which runs through Park County, east and west. The Bozeman area has become one of the state's fastest growing urban areas and Bozeman and nearby Belgrade have a combined population of about 50,000. The Gallatin Airport has become the busiest airport in Montana, with the number of air travelers now surpassing those using the airport of the state's largest city, Billings.

So, some of Park County's population growth and stability can be attributed to the close proximity of a quality and growing city with a very good airport. Bozeman area employers also employ a large number of Park County residents. Many more residents of Park County have jobs in nearby

Bozeman than those living in Gallatin County who work in Park. And this provides a net gain in labor earnings for Park from these outside jobs, which is discussed later. Livingston had a 2010 Census population of 7,044, accounting for about 45 percent of the Park County's entire population. A more recent population estimate in 2014 placed Livingston's population at 7,245.

Much of the population growth in Montana over the last several decades has been focused in the western, more mountainous third of the state and in and nearby the state's more urban areas. Montana has no truly large cities, but it does have seven small cities, including three designated "metro areas" (Billings, Missoula, and Great Falls). Smaller population centers are Bozeman-Belgrade, Helena, Kalispell-Whitefish, and Butte-Silver Bow. Most of these cities and their surrounding areas have growing populations, stimulated in part by area amenities. Silver Bow is the exception with its 2015 population of 34,622 well below a mid-'70s level of 43,500.

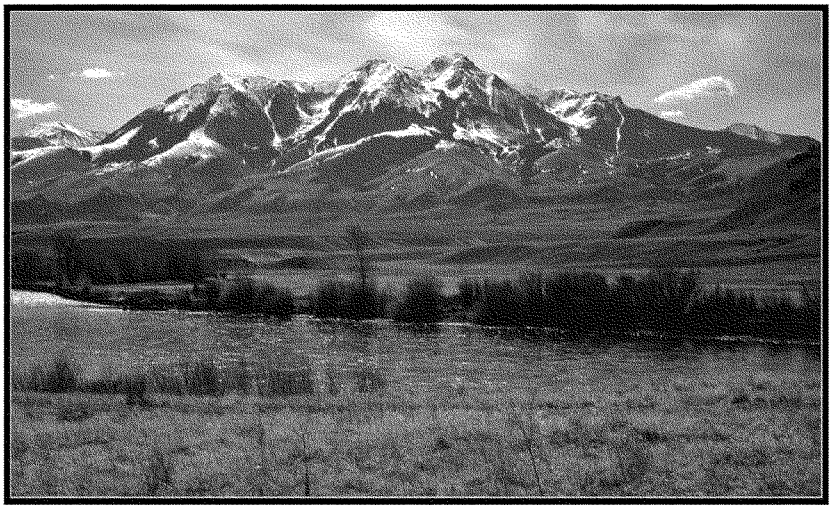
The largely natural areas contained within these large constellations of public lands create a rich and healthy environment for wildlife and help sustain high quality streams and waterways – amenities and area assets that bring large numbers of hunters and anglers to the area each year. These visiting hunters and anglers spend money during these trips which adds further to spending in the area by other tourists and recreationists who visit the area each year for other reasons.



Depuy's Spring Creek in Paradise Valley. http://montanapressroom.com/photo-gallery/big-sky-scenics/

Highway 89 runs the entire length of Park County north and south and serves as one of the major gateways to Yellowstone National Park. The Yellowstone River flows into Park County from Yellowstone Park, running in close proximity to Highway 89 through what is called the "Paradise Valley." There are several small unincorporated places along Highway 89 in the Paradise Valley including Gardiner and nearby Jardine on the Park's edge, Corwin Springs, Miner, and Emigrant and nearby Chico Hot Springs, Pray, and Pine Creek – all places south of Livingston. There are a few other small places in the county north and east of Livingston including Springdale, Clyde Park (which is incorporated), and Wilsall.

The Paradise Valley is framed on each side by impressive mountain ranges including the Gallatin Range on the west and Absaroka Range on the east. It is an idyllic and picturesque area that seems to be almost in everyway appropriately named. The Absaroka Range has several large mountain peaks visible from Highway 89, including Emigrant Peak shown in the photo below. The peak rises to an elevation of 10,915 feet and is a well-recognized landmark of the valley and mountain range. It is surrounded by an incredible collection of environmental and scenic attributes, from national forests and wilderness areas, to lush valleys, and clean free-flowing streams.



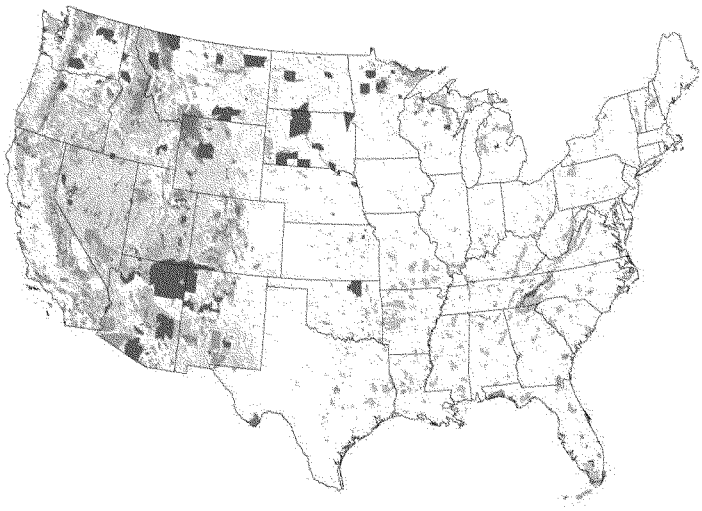
Looking across the Yellowstone River toward Emigrant Peak. https://www.flickr.com/photos/sjb4photos/4456696365

Larger regional patterns of population growth and decline

Many isolated rural counties in Montana and the larger region have tended to gradually lose population. Areas where this decline is most pronounced and longstanding tend to be ones with fairly narrow economic dependencies on production agriculture. Meanwhile some rural areas that are nearby federal public lands, including national forest lands and national parks, are seeing fairly consistent population growth.

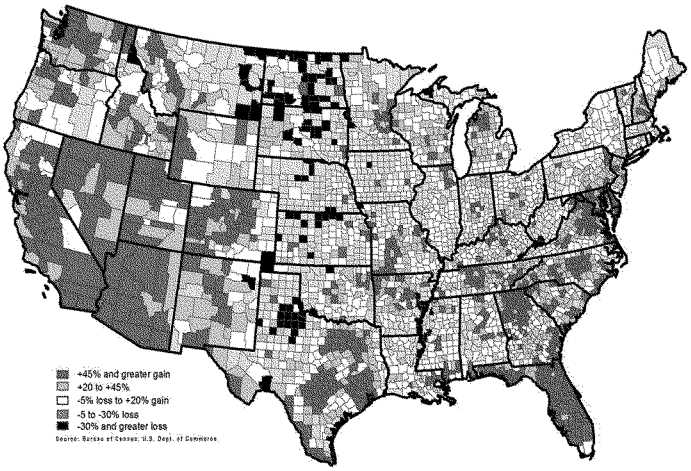
The maps contained in Figure 8 show the location of various categories of national public lands – Forest Service lands, National Park lands, BLM lands, reservation or Bureau of Indian Affairs lands, and others – and below it is a map showing population growth by county over the period from 1980 to 2010. It is relatively easy to see the correspondence between where population growth is occurring in the western U.S. and the location and concentration of these national public lands, particularly national park lands and forest lands. A number of studies have noted this and attribute much of this growth to the growing influence of natural resource amenities in attracting and retaining area residents as well as many kinds of businesses.[4] These studies document how growth is occurring in areas nearby national parks, including areas nearby Glacier and Yellowstone National Parks.

Fig. 8: Public Lands in the U.S. under Federal Management



Note: Lands shown include Bureau of Land Management (BLM) lands (yellow), U.S. Forest Service Lands (dark and light green), National Parks (mauve/pink), Bureau of Indian Affairs (brown), and other federal lands.

Fig. 8: Percentage Population Change in the U.S. from 1980 to 2010



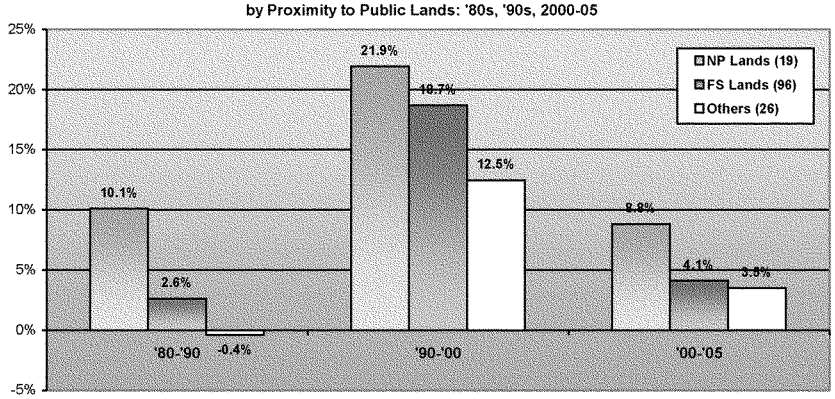
Source: Created by the O'Connor Center for the Rocky Mountain West, U. of MT, using U.S. Census data.

Natural Amenities and Area Economic Growth

People like living in areas nearby these national parks, mainly because these areas have unique and attractive environmental qualities – large open and natural landscapes, diverse vegetation, unusually clean streams and lakes, and large wildlife populations and productive fisheries. These features and attributes attract a growing number of visitors, including hunters, anglers, recreationists, and simply tourists and travelers. Older adults visit and sometimes retire in these areas. And, more young adults are finding ways to live and work in these same areas, drawn by their high quality of life, recreation opportunities, and oftentimes, welcoming communities.

In a study by Swanson, counties lying in and nearby the Rocky Mountains and its various ranges in Montana, Idaho, Wyoming, and Utah and outside of metro and more urban areas were classified based upon proximity to national parks and national forest lands. Those nearby both national parks and forest lands were treated as counties nearby parks. Rural areas in this mountainous area not nearby either parks or forest lands were simply classified as "other." Population trends in these three sets of non-metro mountain counties, 141 in all, were then analyzed, looking at the '80s, '90s, and period from 2000 to 2005 (chart below).

Fig. 9: Population Change for Non-metro Mountain & Mountain Fringe Counties by Proximity to Public Lands: '80s, '90s, 2000-05



Source: Swanson, 2007 (141 non-metro mountain counties in all)

In all three periods rural counties nearby national parks (which includes Park County, Montana) are generally experiencing more population growth than ones not nearby these parks. Areas nearby national forest lands also have more population growth than ones without these lands. So, clearly, proximity to these kinds of national public lands has become an important factor in area population growth across the region and not just for Park County.

These lands contain area environmental and recreational amenities that many people, old and young alike, want to live nearby. They want to recreate in and visit places nearby these lands. And this is shaping regional population trends and area economic activity and viability. As more people find their way to national parks, like Yellowstone, it will only bring places like Park County and its Paradise Valley into more contact with people from other places. And because of the obvious allure and beauty of this area, this visibility will continue to translate into some new residents for the area every year.

Recent research compiled from surveys of Montana residents by the Institute for Tourism and Recreation Research (ITRR) at the University of Montana found: "Features that attract people to Montana for vacations are many of the same qualities that residents of the state appreciate as part of our home environment – open and un-crowded spaces, wildlife, public lands, and abundant recreation opportunities. [...] Montanans who relocated to the state as a result of having an opportunity to vacation or work seasonally here have a positive, state-wide impact in terms of business creation and business diversity."[5]

Some of these new residents will make the county their primary or permanent residence, making them part of the county's resident population. Others will become part-time residents with homes in the area. Both will grow in number in the years ahead and continue to factor heavily into area economic activity and vitality.

More recent trends in area economic growth and change only further and more fully affirm the strong connection between area economic vitality and the quality of area amenities and area quality of life. While the nexus between area amenities and area economic performance is sometimes complex and difficult to measure, there has been a steady stream of research validating this link in examining growth trends in the wide diversity of rural and non-metro areas across the U.S. The most comprehensive and sustained work on this subject has been by the Economic Research Service (ERS) of the U.S. Department of Agriculture.[6]

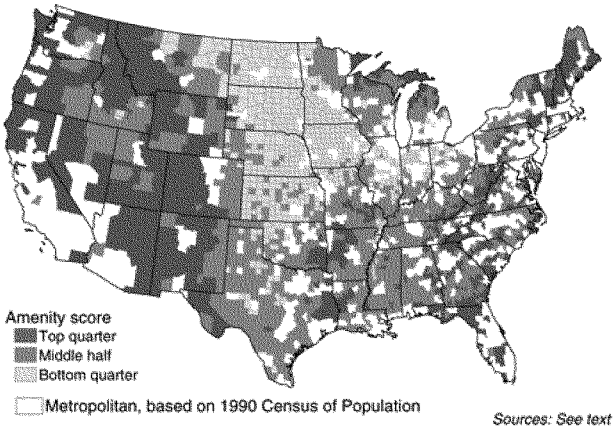
The ERS web site notes: "The rural outdoors has become a major asset for rural communities. The rural outdoors can be enhanced through the construction of recreation facilities, but undeveloped rural landscapes have appeal on their own, both for recreation and as attractive places to live." ERS staffers have developed measures for what seem to most influence rural population and employment growth.

A system by McGranahan, Wojan, and Lambert scores U.S. counties on area amenities that "incorporates weather and temperature measures, but also attributes that rank high with persons who value outdoor recreation opportunities in their location decision making – like topographic variation or the presence of mountains, presence of water areas like lakes and streams and mixes of forests and open country – also factoring in share of area employment in lodging and eating places."

The upper map in Figure 10 shows how non-metro counties across the 48 contiguous states are scored and ranked from top to bottom using this system. Dark green counties are ones scoring the highest, with ERS researchers noting: "High-amenity counties tend to be associated with mountain chains or the coast." Included among these are many counties in western Montana and nearby both Yellowstone and Glacier Parks, including Park County, Montana (all shown in dark green). The sub-regional pattern of areas scoring high in amenities has considerable conformance with the pattern of areas of the western U.S. having moderate to high population growth from 1980 to 2010, as shown in Figure 8 on page 9 of this report.

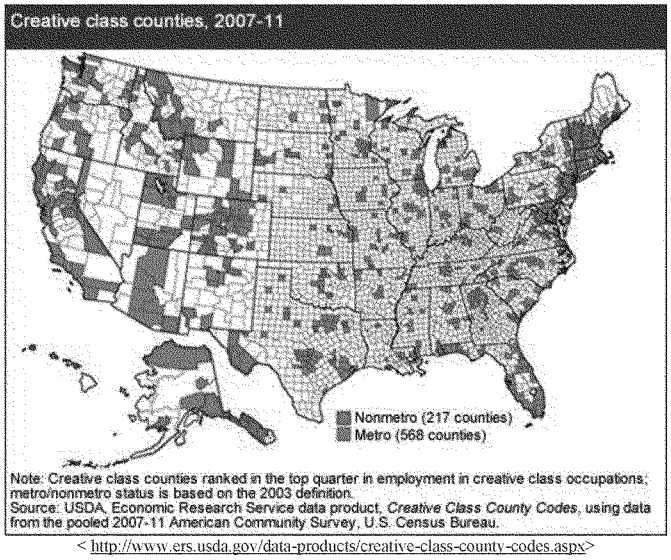
Adding to this is close conformance with the mapping of rural areas of the U.S. having significant area employment in jobs that are considered as requiring "creative skills". A growing number of economic studies, including ones by Richard Florida, are pointing out the importance of jobs that require creative types of work in an economy increasingly shaped by information, knowledge, art, and ideas.[7] "This skill element is defined as one involving 'developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions'."

Fig. 10: U.S. Rural Counties Ranked by Outdoor Amenities



Source: McGranahan, Wojan, and Lambert, "The Rural Growth Trifecta: Outdoor Amenities, Creative Class and Entrepreneurial Context," Journal of Economic Geography, 4-10-2011
http://joeg.oxfordjournals.org/content/early/2010/05/12/jeg.lbq007.full

Fig. 11: U.S. Rural Counties Ranked by "Creative Class" Jobs



< http://www.ers.usda.gov/data-products/creative-class-county-codes.aspx>

The Census Bureau did a special tabulation of occupations requiring creative skills "using unpublished disaggregated occupational categories ... from the latest 2010 Standard Occupation Classification used in the 2007-11 American Community Survey (ACS)."[8] ERS then devised creative class county codes based upon county shares of employment in these detailed creative occupations. These tabulations showed Park County, Montana, had 23.5 percent of its employment in designated creative class occupations, scoring it in the top group of rural counties nation-wide. There are 3,141 counties and county equivalents in the U.S. and 2,051 of these are non-metro counties like Park. In this measure of area creative occupation employment, Park ranked 120th among all 2,051 non-metro counties or in the top six percent of these counties.

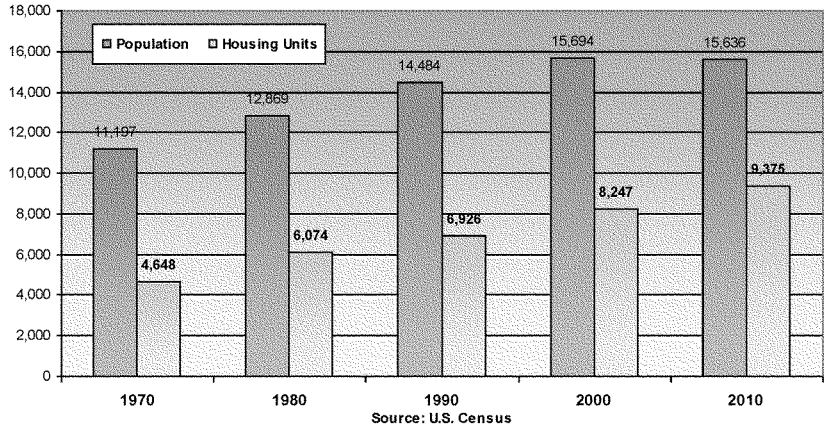
Other Montana counties ranking high for creative occupation employment are Lewis and Clark, Gallatin, Madison, Jefferson, Beaverhead, Missoula, and Flathead, which along with Park all ranked in the top eighteen percent of all U.S. counties, both metro and non-metro included. All of these counties are in the western mountainous portions of Montana and in close proximity to large concentrations of federal public lands. Gallatin's share of employment in these jobs was 30 percent and nearby Madison County also had a 30 percent share. And Park and Teton counties in Wyoming had 22 percent and 32 percent, respectively. So, this accounts for the concentration of these counties nearby Yellowstone National Park.

The combination of high area natural amenities, high levels of creative occupation employment, and strong entrepreneurial climates or cultures are referred to by ERS researchers and economists as the "trifecta" in terms of underlying attributes for economic growth and vitality. Park County is one of only several hundred rural counties across the entire U.S. that appears to possess all three of these attributes, which will become clear in the discussion of area income and employment data later in this report.

Area Housing Numbers and Growth

The figure below shows Park County's population in 1970, 1980, 1990, 2000, and 2010 next to the number of housing units at these times.

Fig. 12: Resident Population & Housing Units in Park Co. Over Time



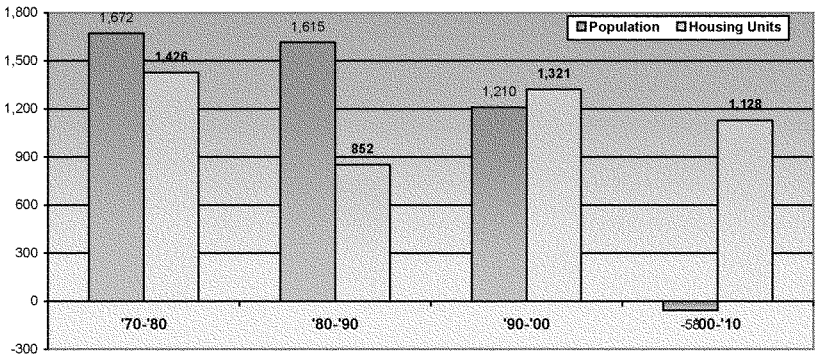
Source: U.S. Census

The number of housing units found in an area largely tracks closely with area population. But the number of persons per household has been decreasing over time, both with smaller families and higher divorce rates, but also from population aging and a growing number of "empty nesters" or older couples whose children are no longer living at home. In 1970 with a population of 11,197 there were an estimated 4,648 housing units in Park County – a ratio of 2.41 people for every housing unit. In 2010 the population totaled 15,636 with 9,375 housing units or 1.67 people per unit. Population figures only include "permanent residents" of the county. A growing number of part-time residents with homes in the county, are not included in the population estimates. However, the houses they may own are counted in the housing data.

At the time of the 2010 Census, 22 percent of Park County's 9,375 housing units were classified as "vacant," with a large majority of these vacant because of "seasonal, recreational, and occasional use." So, housing units are increasing much faster in Park County than is the resident population.

Figure 13 below shows the change in the county's resident population from one period to the next, along with changes in the number of housing units. From 1970 to 1980 the resident population grew by 1,672 people while housing increased by 1,426. During the '90s, however, when migration into western Montana increased significantly and many homes were being built by an increasing number of part-time residents, the number of housing units increased by more than the resident population.

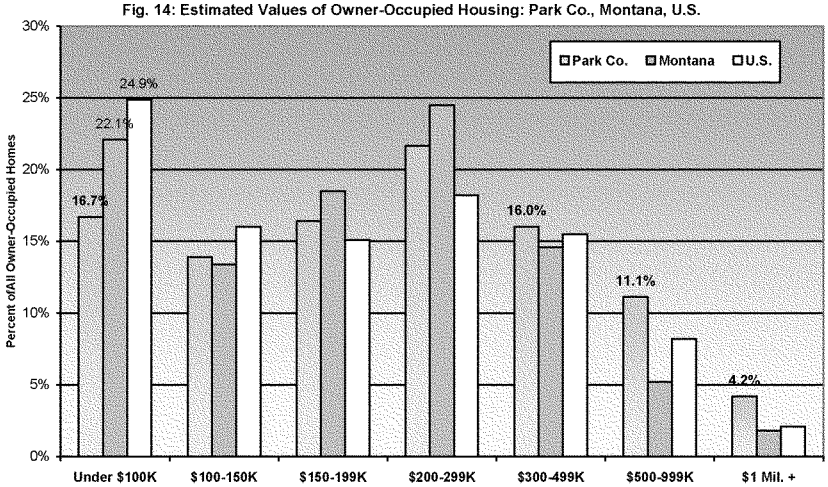
Fig. 13: Decade-to-Decade Change in Population & Housing Units in Park Co.



More recently (2000-10) housing units in Park County increased significantly in spite of a slight decrease in population between these years. And the only way that housing units continue to grow with little or no growth in the resident population is from a growing number of part-time residents who are building and buying homes in the county. This helps sustain area construction activity in spite of stagnant population growth and usually only happens in areas where there are special qualities and features that attract a growing number of part-timers to an area.

The Census Bureau does surveys across the U.S. in compiling information on the value of housing from one area to the next. The data are compiled for home value ranges in Figure 14 for Park County, Montana as a whole, and the U.S.

Fig. 14: Estimated Values of Owner-Occupied Housing: Park Co., Montana, U.S.



Source: Census ACS survey data for 2014

Homes in Park County, Montana, tend to be more expensive than in Montana and the U.S. as a whole. Survey data from 2014 indicated the median price of a home in Park County was $210,100. This is 12 percent higher than the $187,600 median home value for Montana homes statewide and almost 20 percent higher than the median price of a home nation-wide, which was $175,700.

Largely because of the high amenity attributes and attractions found in Park County and their relatively high visibility for travelers and tourists to the area, there is a larger percentage of homes in the county valued at over $1 million – 4.2 percent of the total vs. 1.8 percent statewide and 2.1 percent nationally. And homes valued between $500 thousand to one million dollars account for about 11.1 percent of Park County houses versus 5 percent of homes statewide and 8.2 percent nationally. Park County also has a larger percentage of homes $300-to-$500 thousand in value than statewide and nationally. So, Park County has a higher proportion of higher priced homes. Conversely only 16.7 percent of Park County homes are valued at under $100 thousand, as compared to 22.1 percent state-wide and 25 percent nationally.

The higher values for homes in Park County, largely attributable to the area's attractiveness and amenities, translate directly into increased area wealth, since a home is the single largest asset for many families and individuals who own homes. So, while homes in Park County can be more expensive to buy; for those who own them, their wealth is enhanced because of what the area adds to the value of their homes. When it comes to the relative value of homes, it is almost always a matter of "location, location, location" and Park County as a location is good when it comes to home values. Home values in the area should remain relatively high as long as the area maintains it attractiveness to potential new residents and part-timers.

These higher values also translate into more revenue for local city and county governments and for area schools, who rely upon property taxes for much of their revenue. While it may cost more

to buy a home in Park County, Montana, all things considered, its better to live and work in an area where homes are highly valued than in ones where they are poorly valued, and the differences heavily reflect the desirability of living in one area versus another. Fig. 15 shows the locations of residents and housing units within four general Census County Divisions (CDDs) for Park County. These include the Livingston CCD, Shields Valley CCD north of Livingston, and the Gardiner-Cooke City CCD. A fourth CCD includes a small portion of the county's southern area where Yellowstone National Park extends into Montana. During the 20-year period from 1990 to 2010 the resident population of the county grew by 1,074 people while the number of housing units increased by 2,449.

Much of the increase in housing units was in the Livingston CCD, which extends south to Pray and Emigrant, both Census Designated Places or CDPs, that are in the central part of the Paradise Valley. The Shields Valley CCD in the northern portion of the county accounted for 311 additional units (12.7 percent) with population growth of 200. Within the Livingston CCD, the City of Livingston itself accounted for 642 additional housing units (26 percent of the county-wide total) and its population grew by 343. This means the remainder of the Livingston CCD had an increase in permanent residents of 850 with housing units increasing by 1,150 (47 percent of the total).

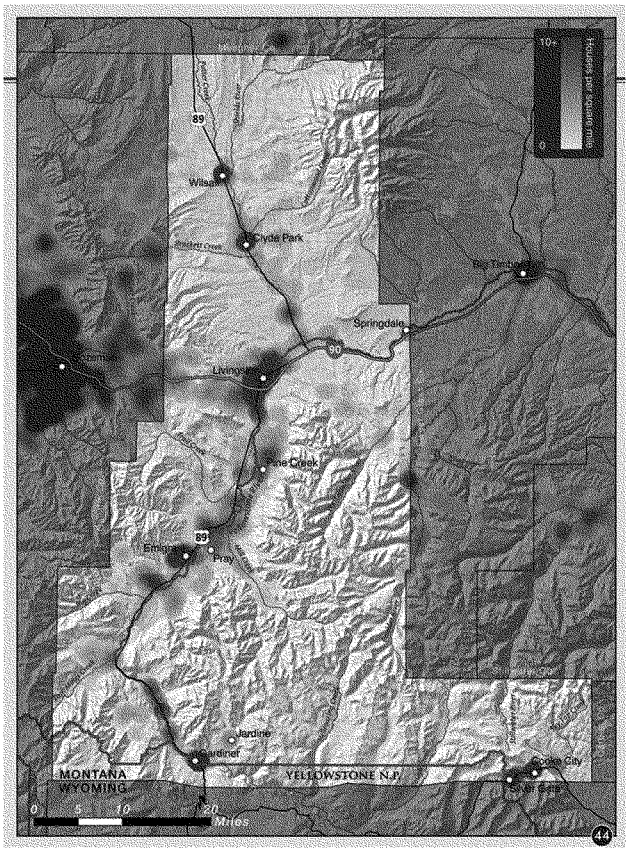
Fig. 15: Population and Housing Units within Park County Census Divisions in 1990, 2000, and 2010

Park County Sub-areas	1990	2000	2010	1990	2000	2010	1990-2010	Change
		Population			Housing		Pop.	H. Units
Livingston CCD	11,132	12,016	12,325	5,236	6,042	7,028	1,193	1,792
Livingston City	6,701	6,851	7,044	3,137	3,360	3,779	343	642
Emigrant CDP	X	X	488	X	X	334		
So. Glastonbury CDP	X	X	234	X	X	157		
Pray CDP	X	X	681	X	X	455		
Springdale CDP	X	X	42	X	X	21		
Wineglass CDP	X	X	256	X	X	120		
Shields Valley CCD	1,585	1,886	1,785	716	906	1,027	200	311
Clyde Park town	282	310	288	130	157	153	6	23
Wilsall CDP	X	237	178	X	119	106		
Gardiner-Cooke City CCD	1,845	1,792	1,493	974	1,299	1,305	-352	331
Gardiner CDP	X	851	875	X	497	556		
Cooke City CDP	X	X	75	X	X	160		
Corwin Springs CDP	X	X	109	X	X	115		
So. Glastonbury CDP	X	X	50	X	X	54		
Jardine CDP	X	X	57	X	X	32		
Silver Gate CDP	X	X	20	X	X	149		
Yellowstone N. Park CCD	X	X	33	X	X	15	33	15
County-wide	14,562	15,694	15,636	6,926	8,247	9,375	1,074	2,449

Source: 2010 Census of Population (housing statistics)

Housing units in the Gardiner-Cooke City CCD grew by 331 over the period while the resident population fell by 352. Clearly housing growth in this southern portion of the county is being driven by a growing number of part-timers who don't count as residents of the county, but do have housing in the county. Figure 16 taken from The Atlas of Park County shows the general distribution of housing and housing density within the county and its various sub-areas, as well as in surrounding counties.

Fig. 16: Housing Density and Distribution in Park County, 2011



Source: The Atlas of Park County Montana, 2013, housing density (p. 44)

The 2010 Census indicated that there were 7,310 "households" in Park County with an average household size of 2.12 persons, all made up of permanent residents of the county. However, the county had 9,375 housing units in the 2010 Census, meaning roughly 2,065 of these were not occupied by permanent residents. The Census Bureau classified 1,308 of these as used "for seasonal, recreational, and occasional use" – meaning that about 18 percent of the county's housing units were for these seasonal and recreational purposes.

There are increasing numbers of people who know about Park County and the quality of life and recreational amenities it offers and have chosen to live there at least part of the year, investing in

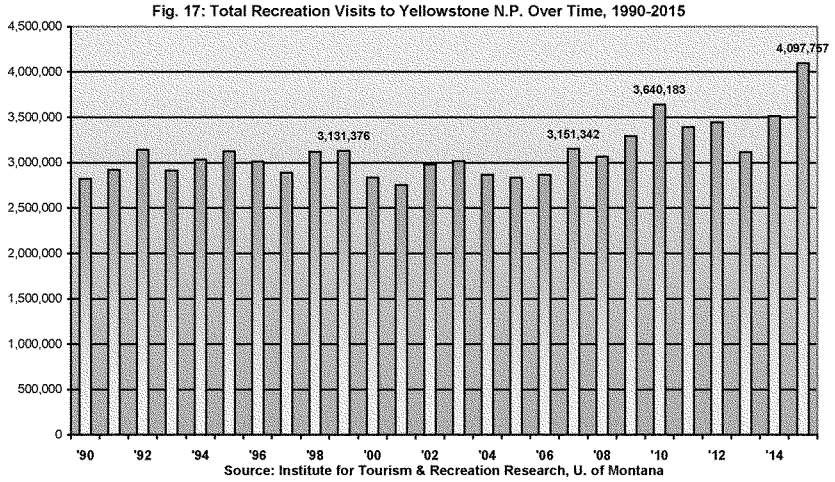
housing to do so. This translates into more retail and services trade in the area for these part-time residents, as well as construction activity associated with the additional housing demand they bring.

Trends in Visitation to Yellowstone National Park

Proximity to Yellowstone National Park has heavily influenced the visibility of Park County and the Paradise Valley area and this influence is continuing with more and more visitors to Yellowstone Park in recent years. Figure 17 shows the total number of recreation visitors to the park for each year since 1990, as compiled by YNP and posted on the web site of the Institute for Tourism and Recreation Research at the University of Montana (ITRR).

Through most of the '90s and up through the middle part of the last decade, visitation to the park was plus or minus three million visitors. Visitation trended up between 2000 and 2010, before falling a bit in 2011 and 2013 during the national economic slowdown. As the economy has recovered, the trend in increased visitation to Yellowstone Park has returned and the park had a record 4.1 million visitors in 2015 – a 13 percent increase from the 2010 level which was the previous record year for visitation at Yellowstone NP.

Fig. 17: Total Recreation Visits to Yellowstone N.P. Over Time, 1990-2015



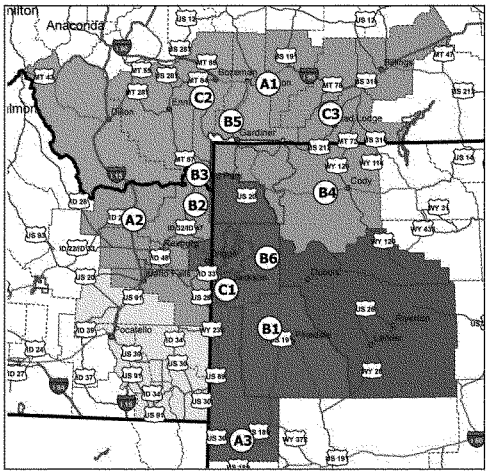
Source: Institute for Tourism & Recreation Research, U. of Montana

Traffic levels to and from the park

The way in which visitation levels to YNP play out in various areas surrounding the park, including Park County, can be gained by examining traffic patterns and volumes on the major highways and gateways to the park. The 2007 study of the region for the Yellowstone Business Partnership included a detailed analysis of traffic flows in the larger area surrounding Yellowstone Park, including traffic into and out of the park's gateways. These gateways are shown in Figure 18 below taken from the YBP study, and are labeled B1, B2, B3, B4, B5, and B6. B5 is the segment of U.S. Highway 89 north of Gardiner on the north edge of YNP. Various sub-areas around YNP were color-coded in the map to signify sub-areas of the Greater Yellowstone Region and Park

County is included in the northwest sub-area shown in orange. Many highway segments are shown across the entire region. But the highway locations above are the park's main gateways.

Fig. 18: Yellowstone National Park and Surrounding Area Highway Segments



- From the 2007 study for the Yellowstone Business Partnership by Swanson

The park's main gateways shown in the figure include:

- **South gateways B1**: 17E (Daniel Junction), and, **B6**: 24 (Togwotee Pass, Teton Co., WY)
- **West gateways B2**: ATR #032 Hwy 20, Island Park, and, **B3**: A-19 Duck Creek (US 191 and 287)
- **East gateway B4**: 35 (Cody West)
- **North gateway B5**: A-20 US 89 N. of Gardiner

Figure 19 shows average daily traffic (ADT) counts for these highway segments from the 2007 YBP study which is taken from state highway department data, covering three years in the early '90s and three years from 2003 to 2005. The west gateway area labeled B2 in Fig. 18 (ATR #032 Highway 20, Island Park) clearly has the highest traffic volume of these six gateway areas, followed by traffic in the area labeled B3 (A-19 Duck Creek, U.S. 191 and 287), also on the west side of the park. The east gateway on Highway 35 (Cody West), shown in light blue, ranks third among these gateways in traffic, followed by traffic through the south gateway at B1 (17E, Daniel Junction).

The north gateway on U.S. 89 by Gardiner ranked fifth in monthly average daily traffic among these six gateway area highway segments. The ebb and flow of traffic in the area follows the seasonality of park visitation, with highs in the middle summer months, usually peaking in July, and lows in the winter months.

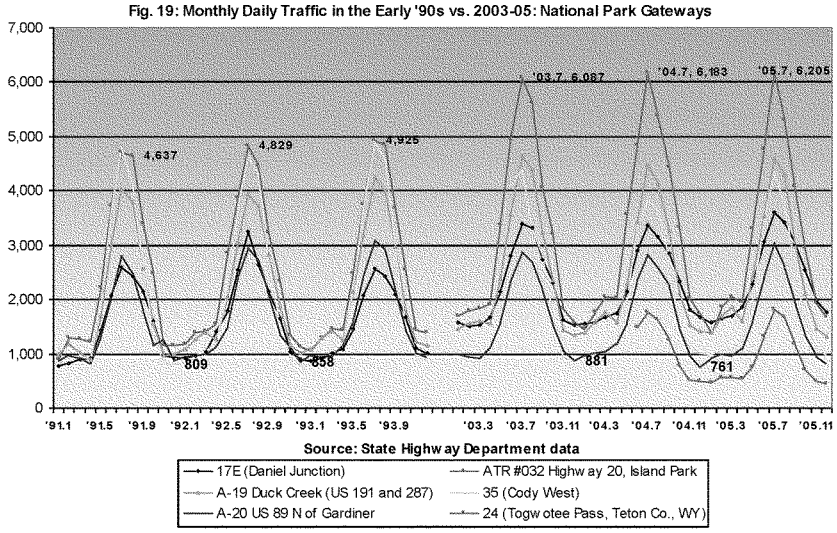
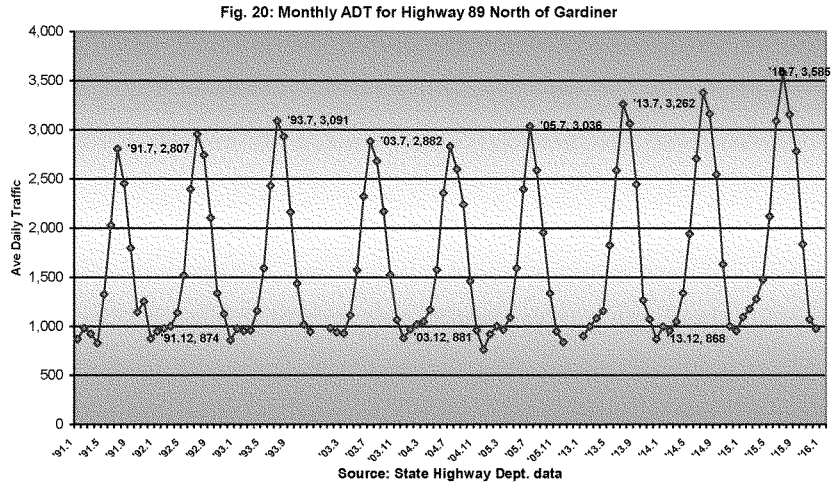


Figure 20 below focuses on the Highway 89 segment north of Gardiner only and includes monthly traffic data used in Figure 18 for 1991 through 1993 and 2003 through 2005. Added to this are traffic data for each month from 2013 through 2015.



In July, 2005, the ADT count for traffic through this north gateway averaged 3,036 vehicles per day. Visitation to YNP for the entire year in 2005 totaled 2,835,650. It rose to 4,097,757 in 2015 – an increase of 1,262,107 visitors or 45 percent. During this same time the ADT for July in 2015 at the north gateway to the park on Highway 89 was 3,585 vehicles a day. This is an increase of 549 vehicles on average each day over the level in July ten-years earlier or an 18 percent increase in traffic. So, there is a marked increase in traffic to and from the park at the North gateway, but the increase is considerably less in percentage terms than the overall increase in visitation to the park – an 18 percent increase in ADT at the north gateway versus a 45 percent increase in overall park visitation from 2005 to 2015.

North Entrance or gateway to Yellowstone National Park on Highway 89 near Gardiner, MT, and Mammoth Hot Springs and, conversely, the gateway from Yellowstone Park into Park County's Paradise Valley

This 18 percent increase is still a very significant increase in traffic through the area and represents multiples of hundreds of additional vehicles a day moving through Park County during the summer. Traffic in the winter months through this area in 2015 is very similar to what it was ten-years earlier as well as another eight years prior to that in 1993. Winter-time traffic at this location over this entire length of time has being in the same range – 874 ADT in December of 1991, 881 ADT in December of 2003, and 868 in December of 2013.

Non-resident Traveler Spending in Park County

When traveling to and from Yellowstone National Park and across Montana, visitors do spend money. The Institute for Tourism and Recreation Research at the University of Montana conducts periodic surveys of these expenditures at key locations throughout Montana. ITRR's most recent survey done in 2015 found that non-resident travelers spend an average of $146.23 per day per group while traveling in Montana. For the roughly 11 million non-resident travelers that visited the state in 2015, this translated into total expenditures of almost $3.6 billion.[9]

The largest categories of spending by these travelers were fuel (22 percent of the daily average), bars and restaurants (18 percent), hotels and other lodging including cabins and RV parks (14 percent), retail sales (13 percent), groceries and snacks (9 percent), outfitters and guides (8 percent), and Made in Montana gifts (6 percent).

Together these categories of spending account for 92 percent of all expenditures by these non-resident travelers, with most spending obviously occurring in places where they stop, stay, and spend time as they travel. Businesses in areas with qualities and things of interest to these travelers are the primary recipients of these expenditures – businesses that provide fuel, food and refreshments, lodging, groceries, and other retail items. Area outfitters and guides employed by these visitors also benefit. Employees of the wide range of affected businesses benefit. Statewide, ITRR estimates that this spending provided jobs for over 37,000 people directly, and another 15,000 indirectly and through induced effects or employment resulting from the added spending that comes from the new income this tourism activity generates.

ITRR staffers compile data on expenditures by non-resident travelers across Montana and they are able to assign some spending to specific counties and regions of the state. They estimated statewide spending by these visitors in 2013 and 2014 averaged $3.8 billion annually. In these years "Glacier and Yellowstone travel regions received the highest percentage of non-resident spending, 33 and 26 percent, respectively."[10] So, nearly 60 percent of all of the spending in Montana by non-resident travelers is in regions surrounding the two larger national parks – Glacier and Yellowstone, which serve as major destinations for these travelers.

ITRR's "Yellowstone" region includes Gallatin, Sweet Grass, Stillwater, Carbon, and Park Counties. This 5-county region as a whole received $970 million in total non-resident traveler spending. ITRR staff examined the economic multiplier of this spending on the region and estimated it supported $780 million in economic activity directly and another $476 million indirectly, including through creating additional area income that is, in turn, spent on other goods and services. They further estimated the combined activity produced 13,520 jobs in the region. So, the overall impact on the area economy is large.

They estimated that expenditures in Park County alone totaled $196 million, or about 20 percent of the 5-county region total. If jobs created by this spending were allocated to individual counties based upon their share of region-wide expenditures, this would mean approximately 2,700 of these jobs are in Park County.

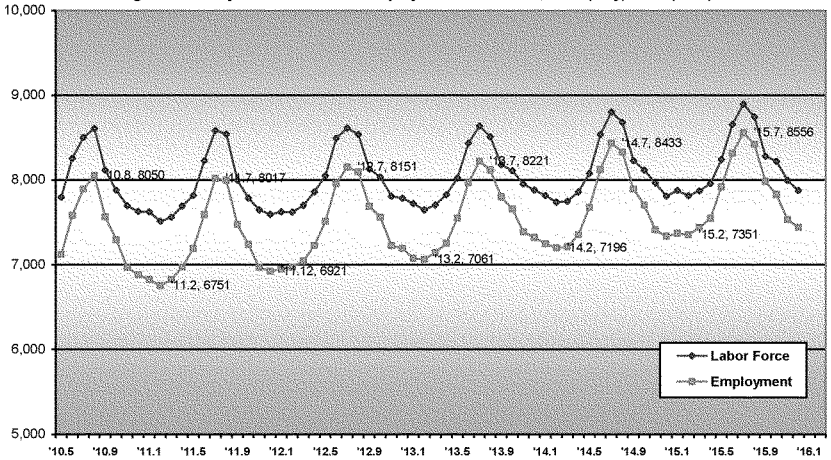
The Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce estimates total employment in Park County in 2014 at 9,445 full and part-time jobs, so 2,700 jobs linked to non-resident traveler spending represent about 28 percent of all jobs in the county. ITRR staff found that only five counties in Montana had more of these non-resident traveler expenditures than Park. These include Flathead with $668 million and Gallatin with $662 million and also Yellowstone ($397 mil.), Missoula ($285 mil.), and Cascade ($264 mil.). Only fifteen counties had expenditures of $50 million or more. Lewis and Clark ($117 mil.) and Silver Bow ($109) both ranked below Park. In terms of non-resident traveler expenditures per capita, no county in Montana with at least $100 million in spending ranks higher than Park County at $12,400 in non-resident traveler spending per resident.

Area Labor Market Trends and Patterns

There is an ebb and flow or seasonality in when this spending occurs, with the larger share occurring in the summer months when visitation in the state and to and from YNP is highest. Areas heavily involved in this would see this same type of seasonality and ebb and flow in economic activity and in employment over the course of a year as well. Almost all areas have seasonality in their labor force and employment levels. However, this is significantly accentuated in areas with a great deal of seasonality in area tourism and visitation. This is certainly the case with Park County, as can be seen in the chart below.

Figure 21 below shows data on monthly employment and labor force numbers for Park County over the last five years (2010 through 2015). The ebb and flow in the size of the area labor force (shown in brown) and in the number of persons employed (shown in orange) are clearly evident.

Fig. 21: Monthly Labor Force and Employment in Park Co., 2010 (May)-2015 (Dec.)



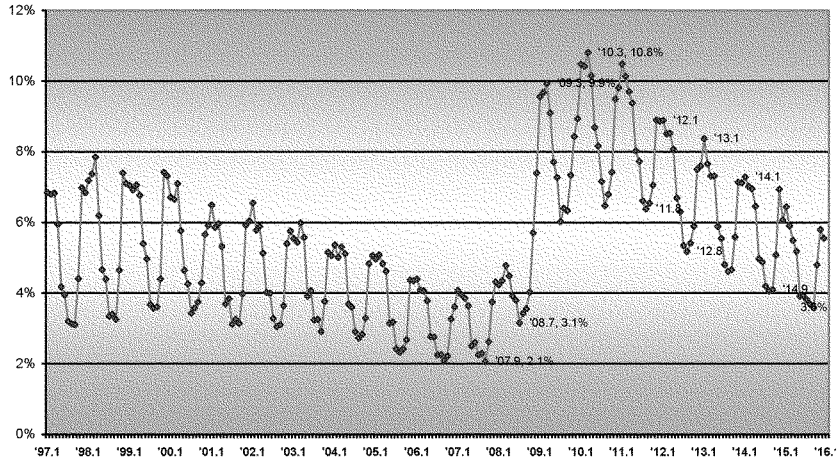
Source: Bureau of Labor Statistics

In Park County much of the seasonality in employment is being greatly affected by area patterns in visitation and traveler activity. County employment reaches highs each year in mid-summer, ordinarily in July, and lows occur usually in February. Over time, July peak employment levels are rising, from 8,050 jobs in 2010 to 8,221 in 2013 and to 8,556 in 2015. In these years employment fell to as low as 7,196 in February of 2014, 12.5 percent lower than the previous July level, and to 7,351 in February of 2015, 12.8 percent below the previous July level in 2014 of 8,433. There are seasonal swings in employment of over one thousand jobs each year from the lows in February to highs in July in Park County.

The labor force of the county is gradually increasing in number, indicated in Figure 21 by the brown line. The July, 2015, labor force was estimated at 8,895 and this is the highest estimate for the county's labor force in its history. In future years the size of the labor force in any area will be constrained as an increasing number of persons currently in the workforce reach ages where they will enter retirement.

Figure 22 below shows monthly unemployment rates over time. Area unemployment usually hits annual highs in January or February and annual lows in August or July, or at the time of peak area employment and seasonal activity. Recent swings in the unemployment rate has been about one and a half percentage points each year, although this swing from high to low became greater in 2009 and 2010 during the recession. Unemployment levels rose considerably from a low in August, 2007, of two percent to a high of 10.8 percent in March of 2010 as the recession intensified. Double-digit unemployment is rare in Park County and only lasted for about one year. Since 2010 the unemployment rate has steadily ratcheted down to lower levels, dipping to 3.6 percent last summer.

Fig. 22: Monthly Unemployment Over Time in Park Co., 1997-2015



At the current rate of recovery, unemployment in Park County should fall to as low as two percent by the summer of 2017. When unemployment falls below three percent in any area, this can be considered a very "tight" labor market, in that there will be increasingly situations where there are not enough workers available for all jobs. While difficult for some employers who can't find enough workers, this situation is conducive to gradual improvements in area wages and salaries.

Area Fishing and Hunting Activity

While the Park County economy is affected by and responds to the rhythm of visitors to and from Yellowstone National Park and visitors to other areas of western Montana, adding to this is visitation to the area by both resident and non-resident anglers and hunters. The Montana Fish, Wildlife, and Parks (MFWP) estimates that resident and non-resident hunters and anglers together spend about $1.26 billion each year in the state while on hunting and fishing trips.[11] This is about $1,250 for every man, woman, and child who lives in Montana with its roughly 1,014,000 residents. But these dollars get spent disproportionately in some areas of Montana than others. And Park County is one of the areas in the state where spending of these dollars is relatively high.

MFWP keeps records on where anglers are fishing and hunters are hunting in the state by district and sub-area, and it also conducts periodic surveys of what these anglers and hunters spend during their hunting and fishing trips and travels. The figures on expenditures are astonishing in some ways, but reflective of just how big and important these activities are in the state and can affect certain areas economically. MFWP estimated there were over 3.5 million days spent fishing somewhere in Montana in 2013, occurring over 38 thousand individual fishing "trips". Each day on these trips spent fishing by a single angler is referred to as an "angler day". About 2.3 million of the angler days were by residents of Montana, or about 65 percent of the total. The largest number of these angler days occurs in July with over 700 thousand. August is the second busiest month for this sport fishing in Montana, followed by June and then September. So, fishing activity in the state is heavily focused in three or four months during the summer.

MFWP data are compiled for lakes and streams throughout Montana and then tabulated for 40 larger drainages. The table in Figure 23 below shows these data for the six busiest drainages within Montana, drainages that together account for nearly half of all angler activity in Montana, meaning that the other half is spread across the other 34 major drainages in Montana.

Fig. 23: Sport Fishing Activity (Angler Days) in Montana for Major Drainage Areas in 2013

ANGLER	SUMMER			WINTER				State
DAYS	Res.	Non-res.	Total	Res.	Non-res.	Total	Grand Tot.	Share
Upper Yellowstone								
Lake	39,629	6,844	46,472	9,241	7,223	16,464	62,936	
Stream	146,956	95,587	242,542	44,187	24,616	68,803	311,345	
Total	186,585	102,431	289,015	53,428	31,839	85,267	**374,282**	**10.6%**
Upper Missouri								
Lake	152,636	9,763	162,399	52,902	9,817	62,719	225,118	
Stream	23,834	9,712	33,546	27,089	5,102	32,191	65,737	
Total	176,470	19,475	195,945	79,991	14,919	94,910	**290,855**	**8.2%**
Madison River								
Lake	23,410	24,337	47,747	7,493	11,839	19,332	67,079	
Stream	40,822	101,628	142,450	22,395	42,460	64,855	207,305	
Total	64,232	125,965	190,197	29,888	54,299	84,187	**274,384**	**7.8%**
Flathead River								
Lake	77,331	18,470	95,801	47,327	14,869	62,196	157,997	
Stream	49,509	15,393	64,902	10,030	3,488	13,518	78,420	
Total	126,840	33,863	160,703	57,357	18,357	75,714	**236,417**	**6.7%**
Missouri River - Dearborn								
Lake	1,229	134	1,363	2,045	0	2,045	3,408	
Stream	87,727	55,095	142,822	58,858	29,985	88,843	231,665	
Total	88,956	55,229	144,185	60,903	29,985	90,888	**235,073**	**6.7%**
Bighorn River								
Lake	7,262	5,886	13,148	1,602	1,863	3,465	16,613	
Stream	26,965	88,211	115,176	14,811	74,849	89,660	204,836	
Total	34,227	94,097	128,324	16,413	76,712	93,125	**221,449**	**6.3%**
Statewide							6 basins	46.3%
Undesignated	12,601	4,872	17,473	4,755	2,279	7,034	24,507	
Lake	712,668	141,410	854,078	295,937	111,390	407,327	1,261,405	
Stream	926,131	674,159	1,600,290	363,205	279,668	642,873	2,243,163	
Total	1,651,400	820,441	2,471,841	663,897	393,337	1,057,234	**3,529,075**	100%
			70.0%			30.0%		

Source: Montana Fish, Wildlife & Parks, "Montana Statewide Angling Pressure, 2013," March, 2015

One of these drainages is the "Upper Yellowstone" which is positioned over Park County, and also extends into Sweet Grass and Stillwater Counties. The Yellowstone River enters Park County from Yellowstone National Park and runs the full length of the Paradise Valley area. It and other area streams and lakes make the valley one of Montana's premier fishing areas for both resident and non-resident anglers alike. By a considerable margin, the Upper Yellowstone River basin is the single busiest drainage among all of these 40 major drainages in Montana for sport fishing activity with around 374 thousand angler days per year, using 2013 data. This is 10.6 percent of the statewide total. The Upper Missouri basin has the second most angler activity with about 290

thousand angler days (8.2% of the state total), followed by the Madison River with 274 thousand and the Flathead River with 236 thousand.

The agency segregates these data into a 5-month summer season (May through September) and a 7-month winter season (October through April) and the summer and winter angler numbers for each of the six basins are shown in the table. Of the 374 thousand angler days estimated for the Upper Yellowstone, 289 thousand or 77 percent are during the 5-month summer season from May through September. The remaining months are over the winter season.

The data also are separated by resident (Montana residents) and non-resident (persons residing outside of Montana) anglers. Statewide during the summer season about 67 percent of all angler days are by Montana residents. In the Upper Yellowstone the estimate is 64 percent, so about 36 percent are non-resident anglers who fish in the Upper Yellowstone drainage. Anglers who fish the Upper Yellowstone also indicate that the primary species they fish for in this area is trout, including rainbow, brown, cutthroat, and brook trout.

MFWP compiles similar data on area hunting and divides Montana into a number of regions and districts in tabulating data on hunting. These data are tabulated by game species and by sub-area where hunting occurs. Figure 24 shows these estimates for MFWP hunting districts located in and nearby Park County. Data for elk and deer hunting only are shown in the figure – for elk in 2014, 2012, and 2010, and for deer in 2013, 2011, and 2010. Multiple years show how activity varies from one year to the next.

The total number of elk hunter days in Districts 313, 314, 316, and 317 totaled 21,417 in 2014, a bit higher than in 2012 when there were 19,994 elk hunter days in this area, and down from 26,570 elk hunter days in 2010. Elk hunting in the area in 2014 was by 3,299 individual hunters; 2,452 of which were Montana residents (74 percent), the remainder (totaling 847) were non-residents of the state.

Information gathered on the length of these elk hunting trips indicated they occurred over 16,473 hunter days for resident hunters and 4,944 hunter days for non-residents. This elk hunting activity in 2014 resulted in 996 elk kills, 612 in 2012 and 1,397 in 2010. Figure 21 also shows deer hunting activity across Park County area hunting districts.

In 2013 the number of hunters who hunted deer in the area totaled 3,281 with 2,592 or almost 80 percent of these residents of Montana. This deer hunting activity occurred over a total of 19,762 hunter days with 15,865 of these hunter days by residents. A little over 1,500 deer were killed by these hunters in 2013 as compared to 1,353 in 2011 and 1,382 in 2010 when in both of these earlier years there was less deer hunting activity overall in the area.

When you add the totals for elk hunting and deer hunting such as for 2010, there were a total of 43,275 individual hunter days (26,570 elk hunter days and 16,705 deer hunter days) across these area hunting districts. However, MFWP staffers indicate that the two sets of data are not entirely independent of each other. Some of these days involve both deer and elk hunting. While largely done on separate days, they can be part of the same hunting trip. So, there is some cross-over where trips involve both and some undetermined amount of double-counting in these data.

Besides elk and deer hunting there is other hunting activity in the area. In 2014 there were 570 hunter days (543 of these by Montana residents) in the area for mountain goats by 90 resident hunters and eight non-resident hunters, with 73 goats actually killed. These were in MFWP

districts 314, 316, 323, 329, and 330, all in or partially in Park County. These hunter days numbered 608 in 2012 – 566 by residents and 42 by non-residents.

Fig. 24: Elk and Deer Hunting Activity in the Park County Area in Recent Years

	Hunters			Hunter Days			Harvest		
	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total
ELK HUNTS									
Dist. 313 - 2014	580	437	1,017	4,412	2,364	6,776	186	162	348
313 - 2012	517	424	941	3,444	2,349	5,793	79	106	185
313 - 2010	890	407	1,297	5,646	2,178	7,824	274	119	393
Dist. 314 - 2014	1,177	267	1,444	7,571	1,643	9,214	350	119	469
314 - 2012	1,105	291	1,396	7,492	1,761	9,253	205	77	282
314 - 2010	1,490	404	1,894	11,526	2,458	13,984	574	154	728
Dist. 316 - 2014	60	48	108	425	343	768	3	9	12
316 - 2012	97	34	131	677	210	887	6	8	14
316 - 2010	118	45	163	702	212	914	22	22	44
Dist. 317 - 2014	635	95	730	4,065	594	4,659	140	27	167
317 - 2012	606	127	733	3,423	638	4,061	92	39	131
317 - 2010	576	196	772	2,850	998	3,848	160	72	232
Total - 2014	**2,452**	**847**	**3,299**	**16,473**	**4,944**	**21,417**	**679**	**317**	**996**
2012	**2,325**	**876**	**3,201**	**15,036**	**4,958**	**19,994**	**382**	**230**	**612**
2010	**3,074**	**1,052**	**4,126**	**20,724**	**5,846**	**26,570**	**1,030**	**367**	**1,397**
DEER HUNTS									
Dist. 313 - 2013	499	264	763	3,253	1,425	4,678	188	117	305
313 - 2011	459	253	712	2,849	1,372	4,221	186	80	266
313 - 2010	482	183	665	2,903	1,116	4,019	201	74	275
Dist. 314 - 2013	1,027	251	1,278	6,383	1,600	7,983	428	68	496
314 - 2011	960	281	1,241	5,585	1,629	7,214	446	104	550
314 - 2010	1,039	244	1,283	6,230	1,361	7,591	463	109	572
Dist. 316 - 2013	44	19	63	278	112	390	14	3	17
316 - 2011	29	28	57	130	174	304	3	6	9
316 - 2010	51	8	59	234	20	254	11	8	19
Dist. 317 - 2013	1,022	155	1,177	5,951	760	6,711	591	93	684
317 - 2011	818	154	972	4,349	705	5,054	466	62	528
317 - 2010	684	205	889	3,658	1,183	4,841	422	94	516
Total - 2013	**2,592**	**689**	**3,281**	**15,865**	**3,897**	**19,762**	**1,221**	**281**	**1,502**
2011	**2,266**	**716**	**2,982**	**12,913**	**3,880**	**16,793**	**1,101**	**252**	**1,353**
2010	**2,256**	**640**	**2,896**	**13,025**	**3,680**	**16,705**	**1,097**	**285**	**1,382**

Source: Montana Fish, Wildlife & Parks web site http://fwp.mt.gov/hunting/planahunt/harvestReports.html

Big horn sheep hunter days in the area totaled 494 in 2014 – 409 by residents and 95 by non-residents with only four sheep recorded as killed. These were in MFWP districts 300, 303, 304, and 500. These hunter days in the Park County area totaled 346 in 2012 and 493 in 2010 – the latter with 321 resident hunters and 172 by non-residents. There also is some moose hunting in the Park County area. In 2014 this included eight hunters (7 residents and one non-resident), spending a total of 98 hunter days in the area (92 by residents and six by non-residents), with six moose killed. In 2012 these hunter days for moose hunting totaled 78 with all of these by resident hunters and the MFWP districts involved included 314, 315, 322, and 329. So, when you fully tally all of the sport fishing and hunting activity in the area together, it is considerable.

Area Spending by Hunters and Anglers

MFWP also conducts periodic surveys of what these hunters and anglers spend while on these trips. These expenditure estimates are in the table below:

Fig. 25: Estimated Per Day Expenditures by Hunters and Anglers in Montana, 2013 Survey

Expenditures Per Day for Hunters & Anglers	Transportation		Food		Equip/Other		Total Exp. Per Day	
	Residents	Non-res.	Residents	Non-res.	Residents	Non-res.	Residents	Non-res.
Elk Hunters	$38.63	$87.08	$23.98	$101.08	$13.99	$258.17	**$76.60**	**$446.33**
Deer Hunters	$35.62	$91.92	$18.86	$104.12	$14.15	$190.48	**$68.63**	**$386.52**
Moose Hunters	$66.10	$112.40	$37.37	$92.58	$42.60	$246.85	**$146.07**	**$451.83**
Bighorn Sheep Hunters	$66.10	$112.40	$37.37	$92.58	$42.60	$246.85	**$146.07**	**$451.83**
Mountain Goat Hunters	$66.10	$112.40	$37.37	$92.58	$42.60	$246.85	**$146.07**	**$451.83**
Waterfowl Hunters	$32.06	$91.07	$17.22	$130.14	$15.42	$78.74	**$64.70**	**$299.95**
River/Stream Anglers	$32.34	$88.04	$27.90	$181.36	$20.27	$115.90	**$80.51**	**$385.30**
Lake/Reservoir Anglers	$47.44	$83.12	$28.39	$117.59	$11.53	$80.07	**$87.36**	**$280.78**

Source: 2013 Expenditure Survey by Montana Fish, Wildlife & Parks (This research is summarized in: "Summary of Research, Statewide Estimates of Resident and Nonresident Hunter & Angler Expenditures in Montana (2014)," by Michael Lewis and Zoe King, Dec. 2014, HD Unit Research Summary No. 39). Figures in the table above were refined in work for MFWP by Neal Christensen, provided by M. Lewis for use in this study.

Expenditures are tabulated for three general categories: 1) transportation, which includes costs of gas, car rental, airfare, and any other transportation expense; 2) food and beverages, which includes all food purchases related to these trips, as well as lodging expenses (although the per day cost for all of these appear somewhat low with lodging included); and 3) equipment and other expenses, which includes any equipment or supplies purchased just for these trips, not to include durable items like guns, rods, boots, boats, etc., and access and guide fees and all other expenses. Expense information is gathered for total trips and then averaged over the number of days involved in these trips to arrive upon per day averages.

For the 21,417 hunter days for elk hunting in the area in 2014, expenditures for the 16,473 of these hunter days by residents would total $1.26 million at $76.60 per hunter day and for the 4,944 non-resident hunter days would total $2.2 million at $446.33 per hunter day. Together these total nearly $3.5 million in expenditures by all elk hunters in the area.

For the 19,762 hunter days for area deer hunting in 2013, expenditures by the 15,865 of these hunter days by residents would total $1.1 million at $68.63 per hunter day, and for the 3,897 of these hunter days by non-residents would total $1.5 million. Together with the elk hunter expenditures these would come to about $6 million in total. Discounting this for some overlap in deer and elk hunts during the same trips, this expenditure total would be close to around $5 million annually.

Adding to this are expenditures by moose, sheep, and goat hunters in the area. The same per day expenditures are used by MFWP for each of these types of hunting. Together, hunting of these three game species in the area totals 1,276 hunter days, 1,201 by residents and 75 by non-residents. Estimated expenditures for these hunters would total $175,000 for residents at $146.07 per day and $34,000 for non-residents at $451.83 per day. So, for hunters only these

area expenditures across all of these major species would come to around $5 to $6 million a year, depending on levels of area hunting activity in a given year.

Using the MFWP estimates for expenditures for anglers, the 374,282 total angler days estimated for the Upper Yellowstone drainage, which includes Park and portions of two other counties, total expenditures for these anglers would be as follows:

Expenditures by River/stream anglers on the Upper Yellowstone –
- 191,143 resident angler days at $80.51 per day equals $15.4 million in annual spending, and
- 120,203 non-resident angler days at $385.30 per day equals $46.3 million in annual spending

This is a total of almost $62 million a year in expenditures by both residents and non-residents fishing in Upper Yellowstone basin rivers and streams.

Expenditures by Lake anglers in the Upper Yellowstone –
- 48,870 resident angler days at $87.36 per day or $4.3 million in annual spending, and
- 14,067 non-resident angler days at $280.78 per day or $3.9 million in annual spending

For area lake fishing, this is total annual spending of $8.2 million for the Upper Yellowstone.

Tallying these together, these stream and lake anglers who fish in the Upper Yellowstone River drainage area spend an estimated $70 million a year during these fishing trips, far more than the estimated $5 to $6 million a year spent by hunters while hunting in Park County area hunting districts. These dollars flow to area gas stations and car rental businesses, lodging and camping facilities, food stores and restaurants, guide services, and other retailers and service providers. They are very important ingredients in the Park County area economy and represent about $4,700 in additional spending for each resident of Park County.

This spending by anglers and hunters is generated and sustained by high quality area natural resources and environmental amenities that provide for large, healthy wildlife populations and world-renowned fisheries. And area businesses benefit enormously from this spending year-after-year on a sustained basis.

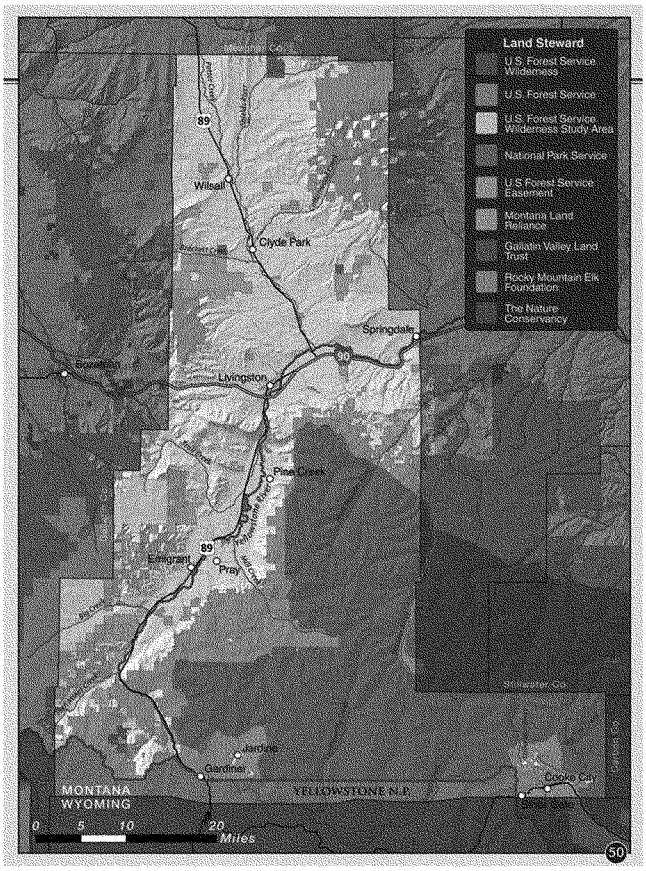
Private Membership Organization Investments in Land Stewardship in Park Co.
The importance of the land and water resources of Park County is well understood and appreciated by both public and private entities and organizations. The public lands of the county have already been discussed. However, adding to these are thousands of acres of land under various types of protection and management by private membership organizations.

These include lands under various levels of protection by the Montana Land Reliance, who largely uses purchase of conservation easements in its land management. According to their web site and mission statement, the MLR "partners with private landowners to permanently protect agricultural lands, fish and wildlife habitat, and open space." And they have made many investments throughout Park County as can be seen in the map in Figure 26 on the next page.

The Rocky Mountain Elk Foundation also has been active in protecting lands in Park County, largely for the purposes of protecting important elk habitat. As stated on their web site: "The RMEF primarily protects crucial elk winter and summer ranges, migration corridors, calving grounds and other vital areas, while focusing on securing and improving hunter access .. [using] acquisitions, access agreements and easements, conservation easements, land and real estate donations, land exchanges and associated acres." < http://www.rmef.org/Conservation/HowWeConserve.aspx>

and, the Nature Conservancy has made several acquisitions in Park County as has the Gallatin Valley Land Trust. So, there is considerable evident of how highly these lands are valued by these private conservation oriented organizations.

Fig. 26: Lands Under Public and Private Resource Management and Protection



Source: The Atlas of Park County Montana, 2013, protected lands (p. 50)

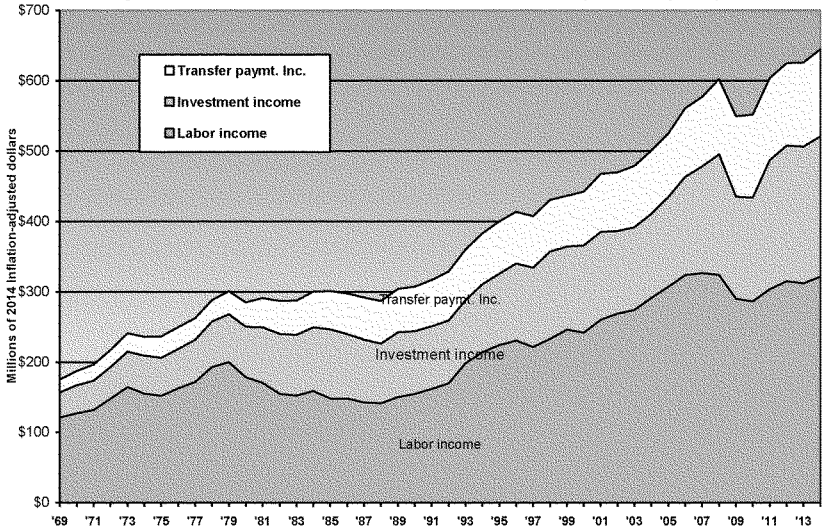
Park County's Growing Area Economy

By virtually every measure, the Park County area economy can be considered a growing one, even taking into account relatively recent declines in some areas of the economy largely tied to the national economic slowdown and recession and financial crisis in the housing sector. Personal income is the single most used measure of the size of an area economy. It includes all income

received by households and individuals (residents of the county only) in any form including wage and salary receipts, proprietor profits, income from rent or other investment income, and income from transfer payment programs like Social Security, Medicare/Medicaid, and other retirement and disability programs. Income data for individuals is recorded or compiled according to a person's county of "permanent residence." So, personal income figures for Park County do not include the incomes of part-time residents who have not made the county their permanent residence.

The total personal income of residents of Park County has been growing at a good pace for a very long time, as can be seen in Figure 27. The chart shows personal income by major source over the last 45 years for county residents. Dollar amounts are measured in millions of inflation-adjusted 2014 dollars. There was very little real growth in total personal income in the county during the '80s, which was a very difficult financial period for production agriculture and for the wood products sector. From a high of about $300 million in 1979, personal income had sputtered its way to $307 million in 1990 – very little growth over this period.

Fig. 27: Total Personal Income of Park Co. Residents, 1969-2014 (inflation-adjusted)

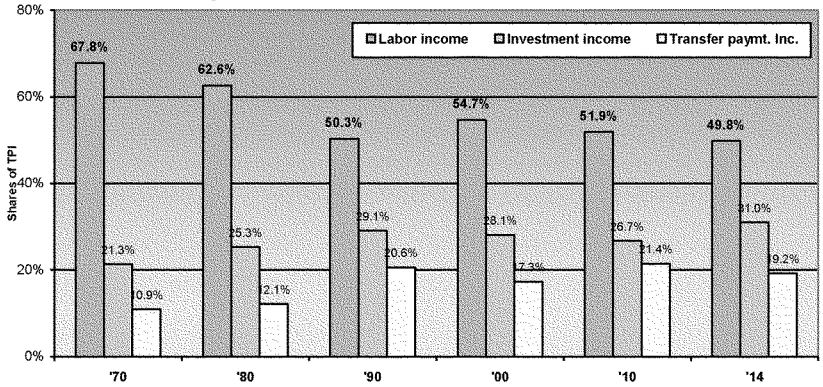


Source: BEA, U.S. Dept. of Commerce

Conversely, the decade of the '90s was largely a period of growth with personal income reaching $442 million in 2000 – growth of $135 million over the 1990 level and a 44 percent increase. Growth continued to accelerate and reached $603 million in 2008, an increase of $160 million over the level in 2000. The economic slowdown then took a toll and personal income in the county fell for two years, falling to about $550 million in both 2009 and 2010. Recovery fully began in 2011 and personal income in Park County grew to an all-time high of $645 million in 2014 (the most recent data). Figure 28 shows shares of total personal income accounted for by these major sources over time. During the '80s labor earnings growth in Park County was flat and

labor income's share of total personal income in the county markedly declined, falling from 68 percent of all income in 1970 to 50 percent by 1990.

Fig. 28: Sources of Personal Income in Park Co. Over Time



Labor income growth returned in the '90s. However, labor earnings' share of total income has fallen a bit from what it was in 2000 and this gradual decline should continue as the area population continues to age and more residents reach retirement age. As this happens, income from non-labor sources will rise more rapidly and continue to shift this balance away from labor income or employment earnings. Older persons living in the county receiving Social Security, government medical payments, and income from their savings and investments, will account for a growing share of area income.

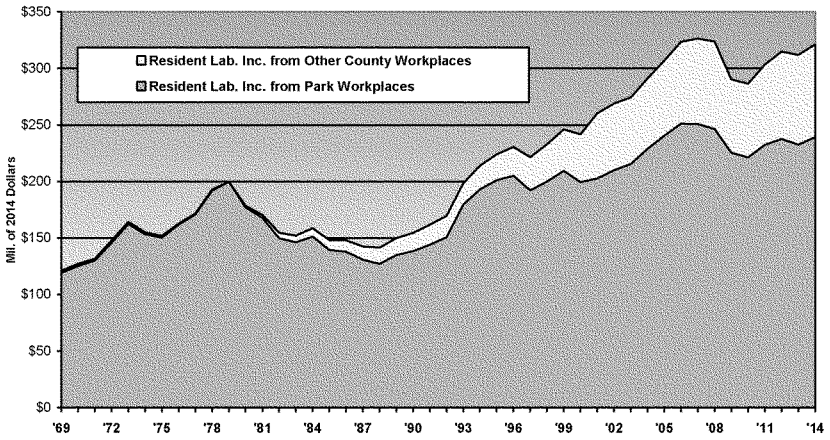
The influence of these older adults and retirees on the local economy will grow as their share of overall income grows. And the more of these residents who continue to live in the county, along with others who may move to the county in the future, the better in terms of overall personal income growth county-wide. So, this becomes another facet of why it is important for areas like Park County to retain their attractiveness and quality of life for a growing number of older adults, particularly when they are no longer working. By the middle of the next decade labor income received by area residents is very likely to drop to 40 percent or less of total personal income in the county. The larger share of personal income will be in the form of investment income and various sources of retirement income and medical payments.

Labor Earnings by County Residents from Workplaces Outside the County

Figure 29 shows labor earnings received by all Park County residents (permanent residents of the county) by place of work or for workplaces in Park County itself and for workplaces outside of Park County. The latter category is calculated by subtracting labor income earned by non-residents of Park County who work at jobs at workplaces in Park County from labor income earned by Park County residents in workplaces outside of the county. So, it is the "net" of these two amounts and if the net is positive or greater than zero it means that Park County is a net importer of labor earnings from jobs outside of the county. As can be seen in the chart below, this labor income adjustment is positive for Park County and the county is a new importer of labor income. The share of income from jobs at workplaces outside of the county also is steadily growing, particularly

since the mid- and late-'90s. This means that a significant and growing number of county residents work outside of the county, but choose to live in Park County and not in the county where their workplace is located.

Fig. 29: Labor Earnings of Park Co. Residents by Place of Work



Source: BEA, U.S. Dept. of Commerce

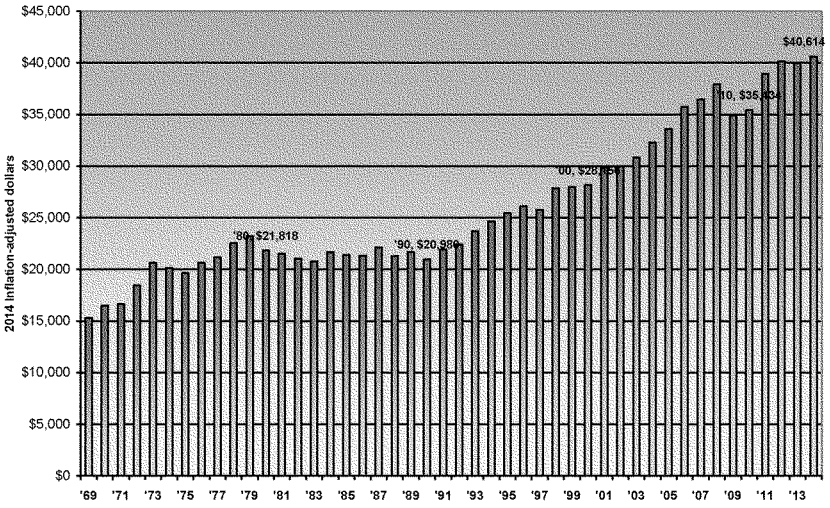
This net addition to labor earnings by residents working outside of the county has grown from only a small percentage of total labor income in the '80s to ten percent in 1990, 18 percent in 2000, 23 percent in 2010, and more than 25 percent more recently in 2014. This fairly rapid increase in this outside labor income is partly the result of growth by Bozeman as a regional employment center and there apparently are a steadily growing number of Park County residents who work in Gallatin or other nearby county. It also suggests that there is a continuing desire of many who work outside of the county to live in Park County. This is in part a reflection of the perceived high quality of life and desirability of living in Park County, which once again factors into area income, with the source in this case being county residents working outside of the county and bringing this income back to Park County communities where they reside.

Growth in Area Per Capita Income

Another important measure of economic growth and well-being is per capita income. Figure 30 shows annual per capita income, or total personal income of the county divided by its population over time, in inflation-adjusted dollars over the last 45 years – 1969 to 2014 (the most recent annual data).

Income on a per-person basis in 1990 was $20,980. By 2000 this had grown to $28,156 and more recently in 2014 had reached an all-time high of $40,614. These gains represent substantial improvement in area well-being. What's more these gains exceed gains in per capita statewide. Park County per capita income was less than the statewide level in 2001 – $29,890 vs. $31,870 for the state as a whole. But the 2014 Park County per capita income level exceeds the state level – $40,614 vs. $39,903. The poverty rate in Park County also is lower than statewide. Recent estimates by the Census Bureau place poverty in Park at 12.3 percent versus 15.2 percent statewide.

Fig. 30: Per Capita Income of Park Co. Residents Over Time, 1969-2014



Source: BEA, U.S. Dept. of Commerce

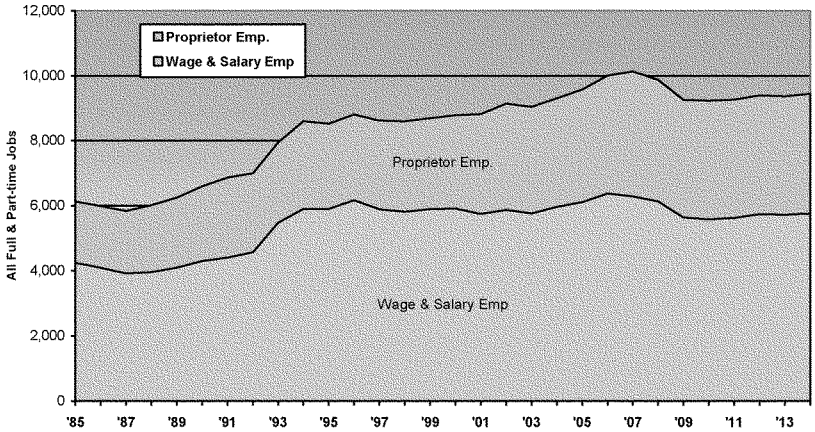
So, economic well-being in Park County, as indicated by these two often-used measures – per capita income and poverty rate – exceeds that of the state as a whole. Per capita income growth at the rate occurring in Park County only happens when income is growing significantly faster than area population. So, even as population growth slowed in the last decade or so, income growth continued at a good pace and per capita income has steadily risen.

Area Employment Growth

Figure 31 shows employment county-wide for two main types of employment; wage and salary employment or persons working for others at a wage or salary, and proprietor or self-employment. The data used in the chart also include all full and part-time jobs. Farm and ranch operators are proprietors in that they work for themselves and there is also a broad range of non-farm proprietors with people essentially working for themselves operating businesses or performing professional services of some type. Proprietor or self-employment represents a significant portion of all employment in Park County, accounting for 39 percent of all jobs in 2014. This has grown over the last decade from about one-third of all jobs before 2000 and this growth has been entirely among non-farm proprietors. Statewide in Montana proprietors accounted for 27 percent of all jobs in 2014, up only slightly from 26 percent in 2000.

So, proprietor employment is relatively high in Park County and high levels of self or proprietor employment is sometimes interpreted as an indication of area entrepreneurial "energy" or status, as in the work by ERS discussed previously. It also is an indication that the area has a lot of small businesses and proprietorships. Proprietors or persons who work for themselves or under their own employment tend to be much more "footloose" than employees who work for others for a wage. That is, they are oftentimes more free to locate and live in many different locations and can take their employment or business with them.

Fig. 31: Total Employment in Park County Over Time, 1985 - 2014



Source: BEA, U.S. Dept. of Commerce

The high percentage of proprietor employment in Park County is at least partly because of these persons wanting to live in the area. And this is a function of the quality of life and amenities that the county offers. Overall employment in Park County is growing, reaching a high in 2007 at 10,133 prior to the recession. After a few years of decline employment is once again growing. You can see in the figure that wage and salary employment growth is relatively flat. The county relies significantly on proprietor employment for this overall growth.

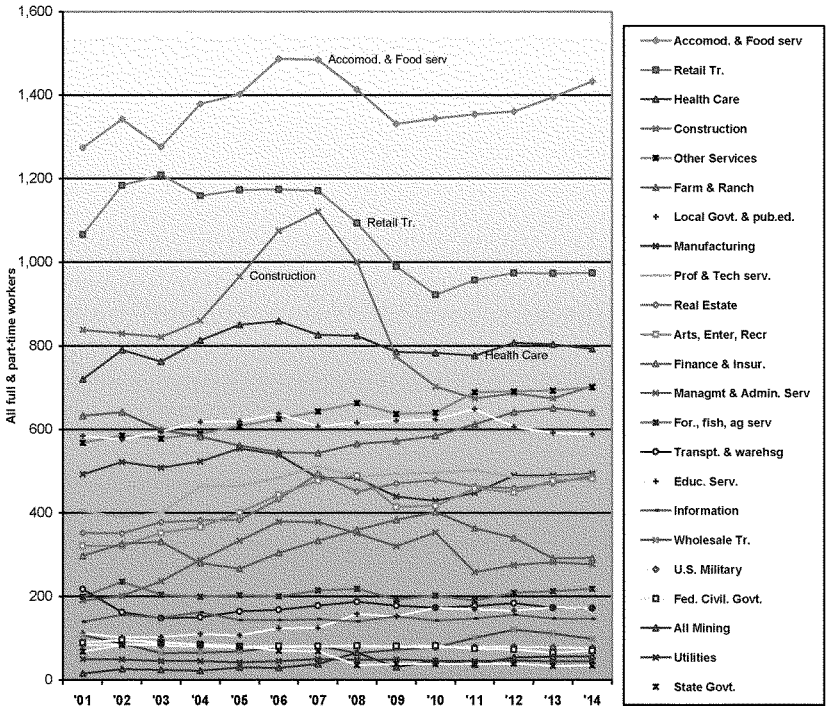
Park County Employment by Major Sector

Total employment, which includes all full and part-time jobs, occurs across and within over twenty different sectors or segments of the economy. These individual sectors are listed at the right of the chart in Figure 32. Individual sectors are arrayed in the chart from top to bottom based upon total employment in 2014 – the most recent year for which such data are available.

The sector with the single highest level of total employment in the county is "accommodations and food services," which includes all types of lodging (hotels, motels, B&Bs, resorts, etc.) as well as restaurants, cafes, bars, etc. It is not surprising that this is the largest area of employment in Park County, given the county and area levels of visitation and dependency on visitors and travelers for their spending on goods and services provided by businesses in Park County.

The broadly defined retail trade sector also heavily caters to and is affected by travelers. It is the second largest sector of county employment. All of the various trade sectors that are likewise affected by consumer spending, by visitors and residents of the area alike are shown in the chart in orange. These other trade sectors include the "arts, entertainment, and recreation services" sector – which includes everything from art museums to ski slopes to bowling alleys and other entertainment and recreation facilities – and also "other services," which includes mainly a variety of personal and household services like cleaning, repair, lawn, personal care services, and a variety of other services.

Fig. 32: Park Co. Total Employment by Major Sector, 2001-14



Source: BEA, U.S. Dept. of Commerce

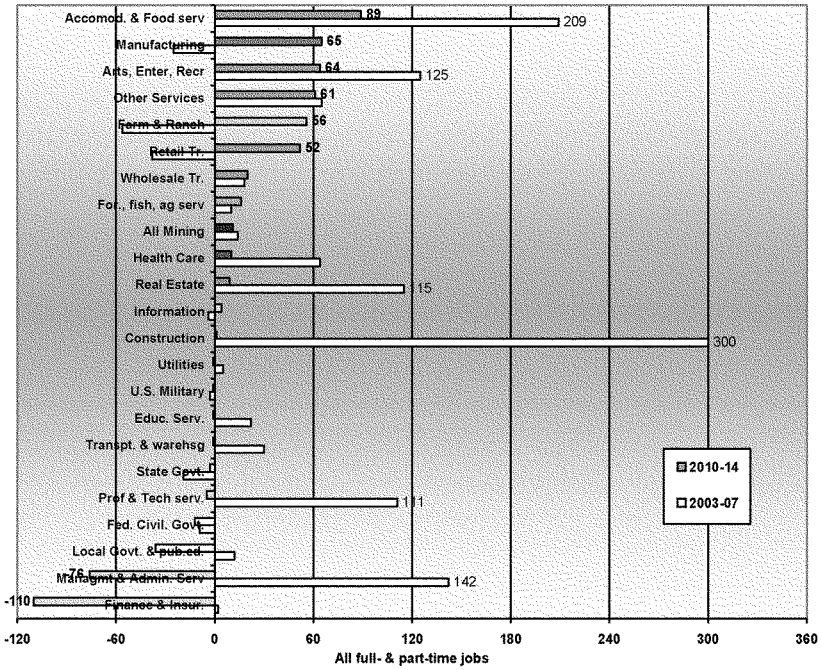
The nation-wide recession began late in 2007 and employment in Park County reflects an economic slowdown in 2008, 2009, and 2010. This is particularly evident in the construction sector, which prior to the recession had become the third biggest employer in Park County, reaching a peak in 2007 at 1,120 jobs. It fell as low as 674 jobs in 2011, a 40 percent decline from 2007. Construction and the housing sector in particular were hard-hit by the recession throughout the U.S. and this had a major impact on the Park County economy. The trade sectors also were significantly impacted by the recession and have yet to fully recover from this.

Pre- and Post-Recession Employment Change by Major Sector

The chart in Figure 33 below focuses on change in total employment in Park County in the four years prior to the recession (2003 to 2007) and in the four years after (2010 to 2014). It does not show employment changes for the period from 2007 to 2010 when the recession depressed national and area economic activity. So, the data used in Figure 31 show how and where the Park County economy was growing and adding jobs prior to this recessionary period and in more recent years after the recession as economic recovery occurs.

Sector employment change from 2003 to 2007 is shown using white bars. The sector with the biggest employment growth leading into the recession was construction where jobs expanded by 300 over the four-year period from a base of 820 jobs in 2003. Next were accommodations and food services (hotels, motels, other lodging, and food and eating places) with growth of 209 jobs from a base of 1,276 jobs in 2003. Jobs in management and administrative services grew by 142, a reflection of expansion of the Park County economy into a wide range of business services. Arts, entertainment, and recreation services added 125 jobs, followed by real estate (+115 jobs) and professional and technical services (+111 jobs). Health care had added 64 jobs in this pre-recession period. So, the pre-recession economy of Park County had most of its job growth in areas affected by area housing growth, travel and tourism, and expansion in business services, which is a fast-growing area of the economy across the larger region and nation as a whole.

Fig. 33: Employment Change by Sector in Park Co., Pre- & Post Recession



In the post recession, the biggest area of job growth has been in accommodations and food services, which added 89 jobs from 2010 to 2014 after losing 141 jobs between 2007 and 2010. Manufacturing added 65 jobs in the post-recession, more than off-setting the 54 jobs lost during the recession. Arts, entertainment, and recreation services added 64 jobs after losing 60 jobs during the recession. Other services, again, largely household and personal service type jobs along with some "membership organization" jobs, has added 61 jobs in the post-recession period with very few losses during the recession. There has also been some recent growth in farm and

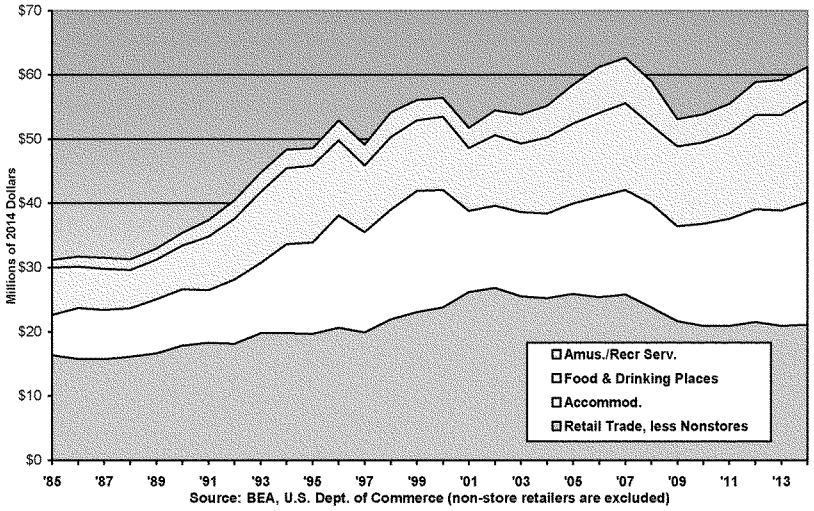
ranch jobs, as well as jobs in retail and wholesale trade. Plus jobs were added in forestry, fishing, and agricultural services. Three of the four sectors adding the most jobs recently are in trade sectors (shown in orange bars). The construction sector has added very few jobs in the post-recession period, after leading the way going into the recession and then after losing 419 jobs during the recession – a loss of 37 percent of all construction jobs in the county. These construction jobs will only be added back gradually as the housing sector slowly recovers.

Five of the seven areas of greatest job growth recently are somewhere in trade (orange-colored bars) – accommodations and food, arts and recreation services, other services, retail trade more generally, and wholesale trade. These are all segments of the economy that are stimulated by traveler activity and by spending by the county's growing number of part-time residents.

Labor Earnings Trends in Sectors Affected by Travel and Tourism

Figure 34 changes the focus from jobs and employment to labor earnings, or what workers in these sectors have been earning in labor income, focusing on the trade sectors most affected by travel and tourism. The four segments in the chart include retail trade, accommodations (lodging), food and drinking places, and amusement, entertainment, and recreation services with labor earnings in millions of inflation-adjusted dollars.

Fig. 34: Labor Earnings in Travel and Tourism Affected Sectors of the Park Co. Economy



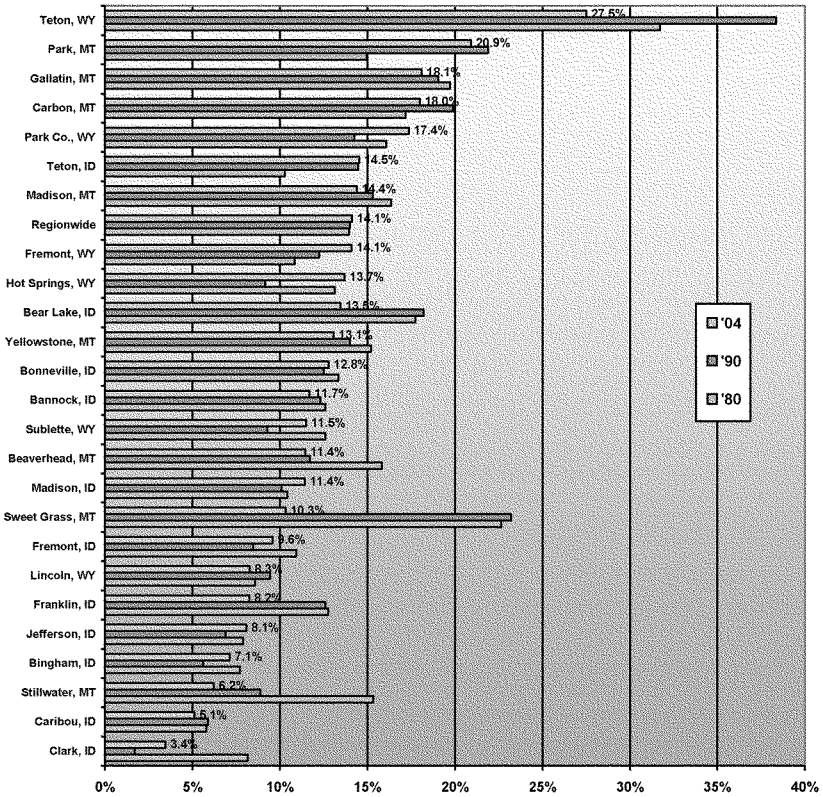
Source: BEA, U.S. Dept. of Commerce (non-store retailers are excluded)

These sectors together have grown in labor earnings from a little over $30 million in 1985 to over $60 million today. However, in the retail trade sector by itself labor earnings reached a high in 2002 at $27 million, but have gradually declined since. So, growth in these sectors overall have grown enough to compensate for these losses in retail trade by itself. Labor earnings in the other segments have continued to grow, with the exception of amusement and recreation services, which hit their peak in 2006 at $7 million. Labor earnings in lodging and food together reached a high in 2014 at $35 million. To be clear, this $35 million is not what was received by lodging and eating and drinking establishments in Park County, it is what was paid by these businesses to

their employees in both wage and salary payments and proprietor income. Overall receipts by these businesses for what they sell would be much higher – four to five times higher – and used to cover many other types of expenses.

In 2014 labor earnings in these travel and tourism affected sectors accounted for over 22 percent of all labor earnings in the county. This is a relatively high percentage for these sectors and reflects a relatively high dependence of Park County on travel and tourism related activity. As proof of this, when the 2007 YBP study was done, 25 counties in the larger three-state region surrounding Yellowstone National Park were analyzed and compared in terms of their dependence on these sectors (shown below in Figure 35).

Fig. 35: Travel & Tourism Related Labor Earnings as Share of Total



Source: 2007 YBP Study -- Swanson, using BEA data [sectors: retail trade, accommodation & food services; arts, entertainment, & recreation services (NAICS); and retail trade, lodging, and amusement & recreation services].

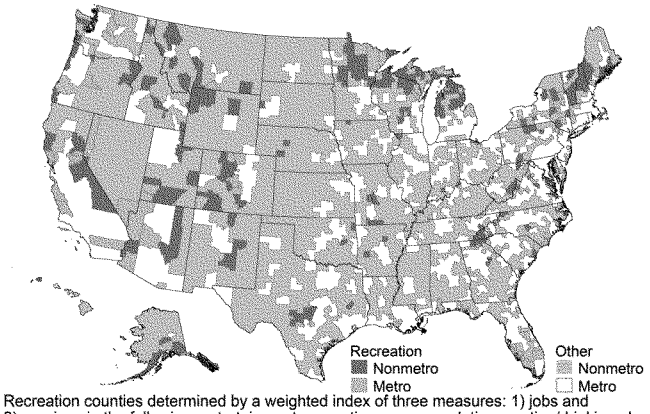
The chart shows shares of total labor earnings in each of these 25 counties in 1980, 1990, and 2004 accounted for by labor earnings in retail trade, accommodations, food services, and arts, entertainment and recreation services. Teton County, Wyoming, where Jackson is located, has the single highest dependency on these labor income sources at 27.5 percent in 2004 as measured in their share of total labor earnings. Park County, Montana, was second among the 25 counties in this dependency at 21 percent in 2004, down slightly from a higher share in 1990. Gallatin, Carbon, and Park County, Wyoming, all had shares or dependencies greater than 17 percent.

So, the 22 percent share for these sectors in 2014 by Park County shows this high dependency on travel and tourism continues and has even increased a bit more recently. As such, this can be seen as resulting from area travel and tourism with more visitors to the area spending money for area goods and services, mainly at trade and service businesses that cater to the things they want. This is a major stimulus and generator of larger economic activity and income in the county.

The Economic Research Service (ERS) of the U.S. Department of Agriculture also has devised a measurement that attempts to identify counties in the U.S. with economies that are recreation dependent. The measures used in this index are listed under the map below and include the share of area jobs and labor earnings accounted for by business classified as entertainment, recreation, accommodations, and eating and drinking places, as well as real estate sales and rental businesses, and the share of housing in an area identified as being primarily for seasonal and occasional use. Non-metro counties with high dependencies on recreation, shown in the darker green below, include Park County – one of less than one hundred non-metro counties nation-wide.

Fig. 36:

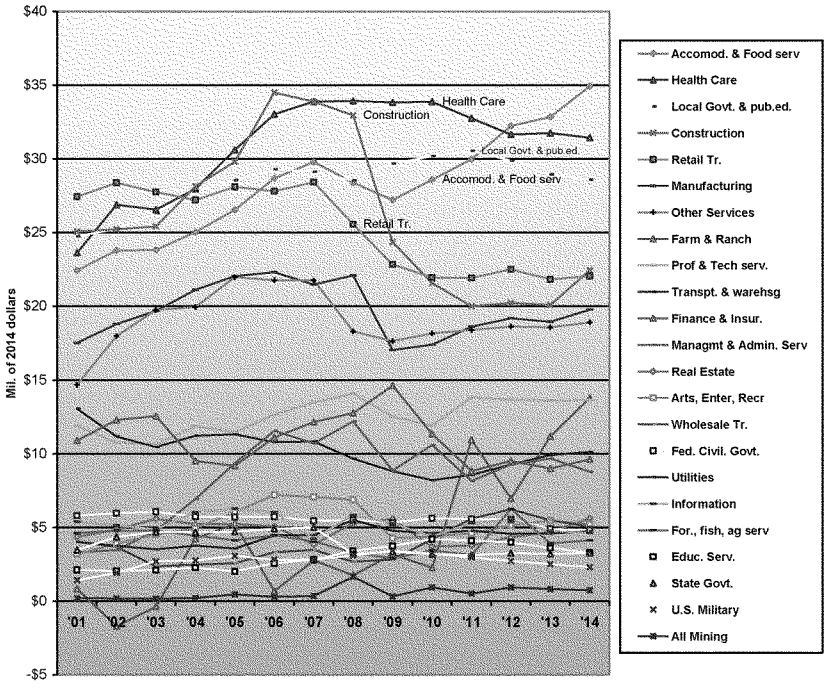
Recreation counties, 2015 edition



Recreation counties determined by a weighted index of three measures: 1) jobs and 2) earnings in the following: entertainment, recreation, accommodations, eating/drinking places, and real estate; and 3) the share of vacant housing units intended for seasonal/occasional use. Recreation counties are those with a score more than one deviation above the mean. Note that county boundaries are drawn for the recreation counties only.
Source: USDA, Economic Research Service using data from Bureau of Economic Analysis and U.S. Census Bureau.
http://www.ers.usda.gov/media/1955254/recreation.png

Figure 37 shows levels of labor earnings for all of the major sectors of the economy of Park County. Annual labor earnings for each sector are shown from 2001 to 2014 in inflation-adjusted dollars with these ranked from top to bottom in the chart by total labor earnings in 2014.

Fig. 37: Park Co. Labor Earnings by Major Sector, 2001-14



Source: BEA, U.S. Dept. of Commerce

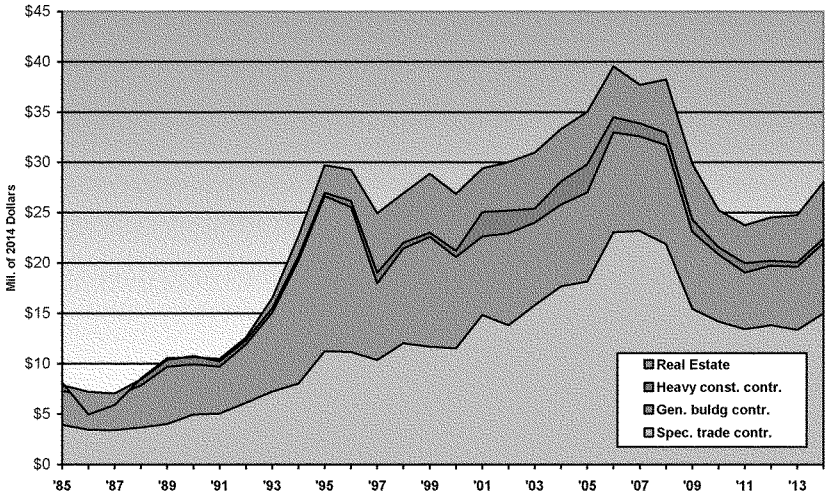
Labor earnings in the accommodations and food services sector rank highest among all of the sectors in 2014 with labor earnings of about $35 million. These have been rising rapidly over the last several years and are, again, indicative of the area's prowess as a place for travelers. Health care, which has the highest labor earnings among all sectors statewide in Montana is second in Park County at about $32 million, down a bit from highs from 2007 to 2010. Local government, which includes municipal and county governments and all public education, is third in labor earnings at $28.6 million, also down from a high three years ago.

The construction sector ranks fourth in Park County in 2014 in labor income at $22.4 million. This is down considerably from a high in 2006 of almost $35 million. Stability was achieved in construction by 2010 and it has begun to rise once again.

The chart in Figure 38 examines levels of labor income for segments of the construction industry – special trade contractors like electricians and carpenters, general building construction, and

heavy construction (roads, bridges, etc.) – over the period from 2001. In areas that are frequented by visitors and that have significant numbers of part-time residents, including ones with vacation or second homes in the area, there tend to be higher levels of construction activity and real estate development and management. Dollars used in Figure 38 are inflation-adjusted, so you can easily see the relatively sharp rise in labor earnings for area workers in these sectors of the economy, with these earnings rising from very low levels in the late '80s of around $10 million annually to almost $40 million at the peak of activity in 2006. This fell below $24 million in 2011 as the recession hit housing and construction throughout the U.S. Most of this decline in Park County was in labor earnings by those working as special trade contractors in construction.

Fig. 38: Construction and Real Estate Labor Earnings in Park Co. Over Time



Source: BEA, U.S. Dept. of Commerce

Construction activity is gradually returning and labor earnings across all of these segments of the industry are now beginning to increase once again.

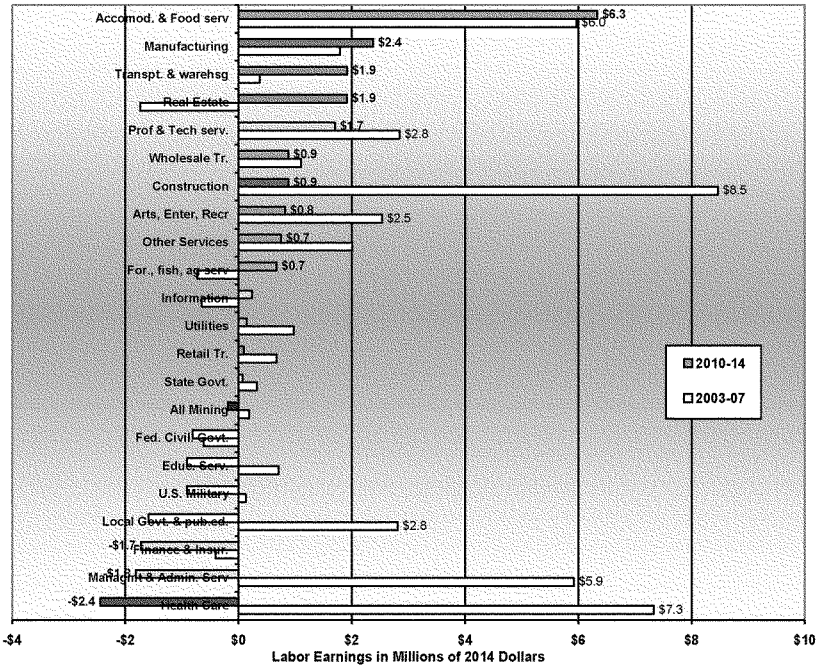
Pre- and Post-Recession Growth and Change in Area Labor Earnings

If we exclude the period when economic activity in the area were temporarily being negatively impacted by the national recession, we can focus on where the economy of the area was growing in terms of labor income leading up to and immediately after the economic downturn. This can help us understand what has been driving labor income growth before and after the recession and also help us to see where growth is likely to be in the near future.

Figure 39 contains a chart that isolates growth or change in labor earnings for individual sectors in the two 4-year periods from 2003 to 2007 (pre-recession) and 2010 to 2014 (post-recession). Sectors are arrayed in the chart from top to bottom based upon labor earnings growth in the more recent post-recession period. The white bars show change in each sector in the pre-recession period. As can be seen, the accommodations and food services sector has had the biggest increase in labor income over this recent period with growth of $6.3 million. This is far more than

the growth in the second fastest growing sector – manufacturing – which had growth of $2.4 million. About 60 percent of Park County manufacturing labor earnings is in "nondurable" manufacturing – areas like food, beverages, printing, etc. Other details about the county's manufacturing sector are difficult to ascertain because much of the more detailed information is "suppressed" for proprietary reasons. This is done when industries or sectors are relatively small and/or when such sectors have few businesses accounting for their activity.

Fig. 39: Nonfarm Sector Labor Inc. Change in Pre- & Post-Recession Periods, Park Co.



Transportation and warehousing has seen recent growth and most of this is in rail and truck transport. Labor earnings of those in real estate are growing; up by $1.9 million in recent years, and there is growth in the professional and technical services sector – accountants, lawyers, engineers, consultants, etc. The next four sectors by growth are wholesale trade, construction, arts and recreation services, and other services. Labor earnings recovery and growth in Park County is being heavily led by the trade and construction sectors, plus manufacturing and transportation, as well as professional services.

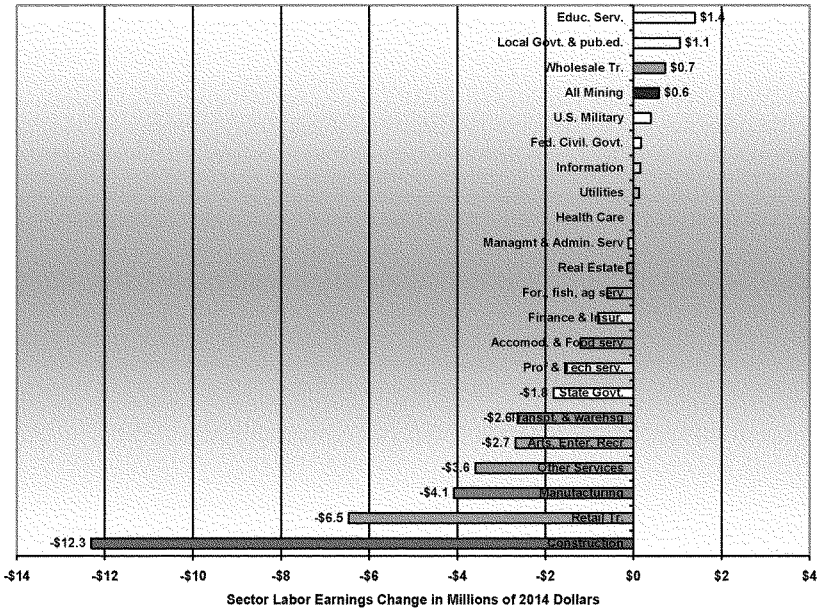
Growth prior to the recession from 2003 to 2007 was led by construction (+$8.5 mil.), health care (+$7.3 mil.), accommodations and food services (+$6.0 mil.), and management and administrative services (+$5.9 mil.). This type of expansion reflects the growth in housing in the area, spurred increasingly by part-time residents; growth in lodging associated with the area's

many visitors; growth in health care services associated with an aging population; and growth in a wide range of business services, many of which are more footloose in terms of location. There is considerably more balance in terms of more recent growth, which is not as fast as labor income growth leading into the recession. The area economy can attribute much of its resiliency and growth to a stable and gradually growing population, the increasing presence of part-time residents, and stable and growing tourism and recreation activity tied to the area's many visitors and travelers. Most areas of government – federal, state, and local – shown with yellow bars in the chart have reduced levels of labor earnings in the post-recession period. Mining, which is a very small component of the area economy, has experienced some recent decline.

Areas of Labor Income Decline during the Recent Recession

The chart in Figure 40 shows how the various sectors of the Park County economy were impacted during the recession between 2007 and 2010, or the years in-between the pre- and post-recession periods. The nation-wide recession started in the housing and financial sectors with devastating impacts in many areas of the U.S. The construction sector of Park County experienced the biggest fallback in labor earnings over this period, falling by $12.3 million from 2007 to 2010, a 36 percent decline. Recovery in construction will take time and will partly hinge upon the continuing flow of new and part-time residents into the county.

Fig. 40: Nonfarm Sector Labor Earnings Change during the 2007-10 Recession



Labor earnings by workers in the retail trade sector fell by $6.5 million – a 23 percent decline. These will gradually recover and a good sign that this is already happening is in the record visitation to Yellowstone Park in the last year and the increased traffic this has brought to Highway

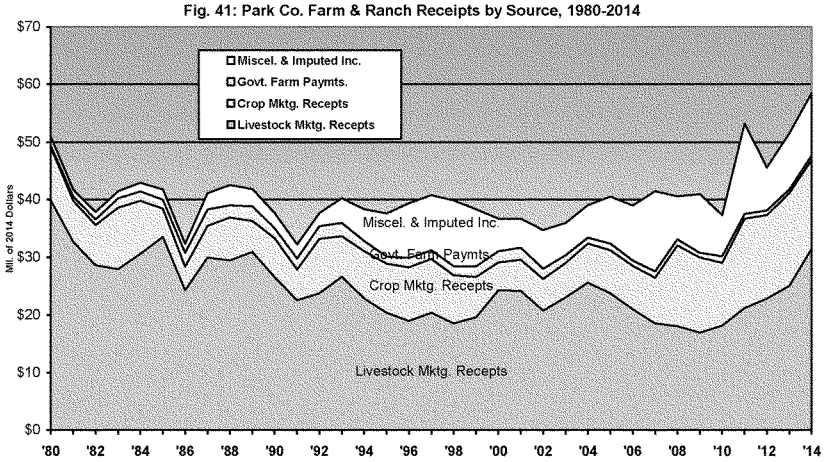
89 through the Paradise Valley, plus the large number of visitors who continue to come to the area for fishing and hunting. There was a marked decline in manufacturing labor earnings (-$4.1 mil.) during the recession, but these are making a strong recovery, up by $2.4 mil. from 2010 to 2014. Recent gains in arts, entertainment, and recreation services and in other services are helping to retrieve losses in these sectors, as is the case with transportation and warehousing.

Area Agriculture

An important sector of the Park County economy is made up of activities by the county's farms and ranches. Farms are defined by the U.S. Department of Agriculture for its censuses are any operations selling at least $1,000 in agricultural product in a year. Park County had 564 farms in 2012, up from 535 farms in 2007. Ninety-eight of these farms had sales of $100,000 or more, another 44 had sales of $50,000 to $99,999, and still another 57 farms had sales of $25,000 to $49,999. The group of farms as a whole averaged 1,372 acres in size, with 159 farms having 1,000 or more acres and 93 of these having more than 2,000 acres. These 93 together had 611,000 acres, about 79 percent of all land in farms, and averaged 6,570 acres in size.

A total of 774,000 acres are contained within the county's farms and ranches, both owned and leased lands, or about 1,210 square miles of land. This represents about 45 percent of the entire county land area. About 110,000 of the 774,000 acres are cropland or about 14 percent of the total in farms – a similar amount both in 2012 and in 2007 during the previous ag census. More than 600,000 acres are some type of pastureland, including woodland pastures, and 538,000 acres of this pastureland is designated as permanent. Cattle in the county numbered 44,400 in 2012 with 23,000 cattle and calves sold in the year. These cattle operations were on only 211 of the county's farms and ranches. The county also had about 2,600 sheep. Thirty-one operations reported that they had some income from "agri-tourism and recreation services;" something increasingly common among farms in areas frequented by tourists and other visitors. Figure 41 shows annual levels of receipts by farms and ranches in the county since 1980 by major category, with dollar amounts adjusted for inflation.

Fig. 41: Park Co. Farm & Ranch Receipts by Source, 1980-2014

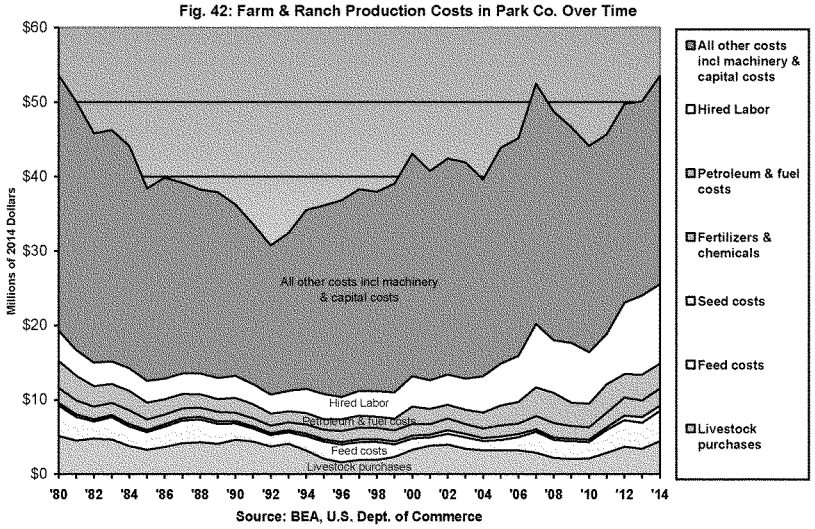


Source: BEA, U.S. Dept. of Commerce

Livestock marketing receipts is the largest source of income for area farms and ranches. In 2014 livestock sales by Park County farms and ranches totaled $31.5 million. Growth in these livestock receipts in recent years has been spurred by rising cattle prices, although these have declined more recently. Receipts from crop sales have been gradually increasing, and have been in the $14 to $16 million range in recent years. Income from government farm programs is fairly low at less than one million dollars annually. Most of the other "miscellaneous" income for farms and ranches is difficult to analyze because of the way these data are compiled. This does include whatever income is received by farms offering "agri-tourism and recreation services" and any other miscellaneous income. It also includes some "imputed income," or income farm operators derive from housing and food as part of their operations.

Figure 42 shows annual costs of farm and ranch operations by major category. The single largest costs item is simply called "all other costs," but includes all machinery and capital costs of farmers and ranchers, including their debt service and financing costs.

Fig. 42: Farm & Ranch Production Costs in Park Co. Over Time



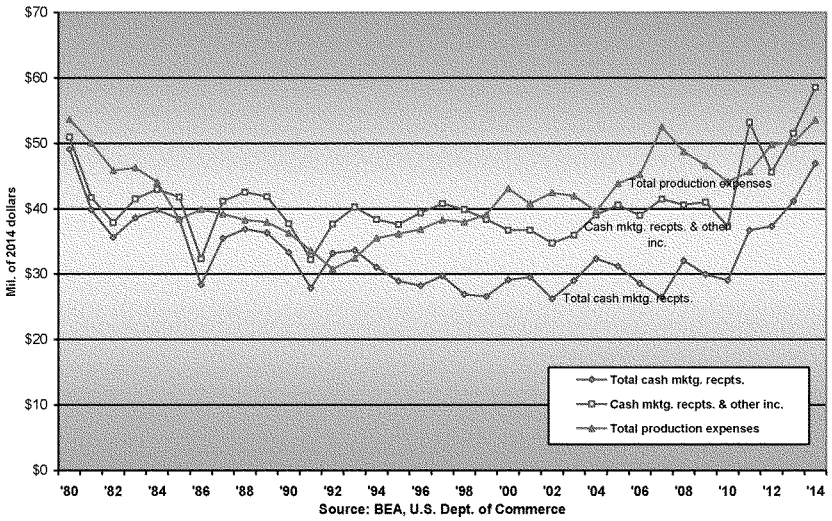
Source: BEA, U.S. Dept. of Commerce

Other costs, like for livestock and feed purchases and expenditures for feed and fuel and for hired labor, are much lower in comparison. But many of these "costs" for ag producers in the area are "revenues" for other businesses in the area who sell these products, materials, and services to farmers and ranchers. So the more than $50 million in expenditures by these agricultural producers are a major economic stimulus in the area, in spite of whatever the profitability may be for the producers themselves on a year-to-year basis. What's more, these costs included $10.7 million in expense for hired labor, which are jobs for others in the area with much of their income from this work re-spent at other area stores and businesses. So, this goes back into the income base and spending stream of the area, supporting other economic activity.

The third largest expense for agricultural producers in the county is livestock purchase costs. As cattle are sold they are replenished both internally through calves and through purchases from other producers. These costs totaled $4.4 million in 2014. Feed for livestock cost $4.1 million, petroleum and fuel costs totaled about $3.6 million, and fertilizer and other chemical costs came to another $2.3 million. So, the gross receipts of area ag producers are spent and redistributed in many ways across these cost categories, translating into other area economic activity.

What the overall profitability of area agriculture is from year-to-year is generally an open question. Figure 43 shows annual totals for all production expenses (red), which include all of the expense items shown separately in Figure 42, in relation to annual cash marketing receipts for livestock and crops (the lower green line), and for all farm income from all sources including miscellaneous ones (the upper green line). This upper green line contains all of the income sources in Figure 41, including livestock and crop receipts, government farm program payments, and any other miscellaneous and imputed income of area farms and ranches.

Fig. 43: Total Agricultural Income & Expenses in Park Co., 1980-2014



Total farm expenses in many years have exceeded income from all farm sources, as was the case in each year from 1999 through 2010. So the financial situation of area ag producers is somewhat precarious in that income oftentimes cannot fully cover production costs. However, this is true in many agriculture-dependent areas of the U.S. and, in particular, in the central and northern Great Plains region.

This situation where costs can consistently exceed receipts can persist in an industry like agriculture because of the collateral against which rising debt is secured – land, which also has been rising in value. However, it cannot be sustained indefinitely and annual revenues must eventually come into line with and exceed true production costs for these operations to be viable.

Summary of Findings and Conclusions

This report provides an up-to-date analysis of key trends and features of the economy of Park County, Montana. Among many other things, Park County is an important gateway to Yellowstone National Park and this more current analysis contains many references to a previous study of the larger area surrounding Yellowstone National Park – a 2007 study done for the Yellowstone Business Partnership by Swanson (cited below in the end notes). The over-arching findings of that study were as follows:

Yellowstone and Grand Teton National Parks lie at the center of the Yellowstone Region, both jewels of the nation's internationally coveted national park system. Surrounding these parks are many more national forest lands and forest wilderness areas, creating one of the largest wild land complexes in North America. [...]

Within these complexes in the valley floors and plateaus reside over 700,000 people and many more to come.

Most of the region's smaller cities and towns are seeing population growth, with more and more people drawn to the region's high quality environment ... because more people want to live in attractive areas with big natural landscapes, towering mountains with healthy forests and grasslands, large wildlife populations, plentiful outdoor and recreational opportunities, and attractive and welcoming communities. [...]

Land-based amenities like forests, mountains, streams, and grasslands on vast landscapes along with the wildlife populations these sustain have become the region's chief economic assets. The biggest challenge lies in not degrading and losing many of these assets as the region and its communities grow and businesses expand.

The more permanent sustainability of economic prosperity in the region requires that this development not be done in ways or in places where environmental resources and assets are unduly and unnecessarily degraded or lost. [2007 YBP Report, cover page]

The importance and relevance of these findings continue to resonate in the continued functioning of the Park County economy and the findings and conclusions of this study are as follows:

- *Population Growth* Park County has had a growing population for a very long time, although this growth slowed in the last decade. Much of the county's population growth has been from positive net migration, or more people moving to the area than the number moving away. Park County population growth was strong in the '90s, largely from positive net migration. Almost all population growth over the next two decades, if it occurs, will be from net migration. Area amenities and quality of life are major factors in migration patterns in the Interior West. Rural areas without these attributes are likely to see continued population decline in the future.

- *Major Factors in Population Growth* Population growth in Park County is being influenced by two major factors – close proximity to a growing urban area (Bozeman), with some of this growth spilling into surrounding areas, and the close proximity and presence of regionally-significant area tourism and recreation resources.

- *Area Attraction for Older and Younger Adults* Older adults visit and sometimes retire in areas like Park County. And, because of the more "footloose" nature of today's economy with information and knowledge-based businesses able to locate more freely, more young adults are finding ways to live and work in these same areas, drawn by their high quality of life, recreation opportunities, and oftentimes, welcoming communities.

- *Household Numbers and Housing Units* The 2010 Census indicated that there were 7,310 "households" in Park County with an average household size of 2.12 persons, all made up of permanent residents of the county. However, the county had 9,375 housing units in the 2010 Census, meaning roughly 2,065 of these were not occupied by permanent residents. The majority of these are classified as being used "for seasonal, recreational, and occasional use" by the Census Bureau.

- *Growing Number of Part-timers* During the 2000 to 2010 period housing units increased significantly in spite of relatively little change in the resident population. This indicates that there are a growing number of part-time residents of the county who are building and buying homes in the county. An increasing number of people know about Park County and the quality of life and recreational amenities it offers and have chosen to live there at least part of the year, investing in housing and other property to do so.

- *Area Housing Costs/Values* Homes in Park County are relatively expensive, with these values buoyed by the area's quality of life and amenities. The median price of a Park County home was $210,000 in 2014. This compares with $187,600 for homes in Montana as a whole and $175,700 nation-wide. The county has a larger percentage of homes valued over $1 million – 4.2% vs. 1.8% statewide and 2.1% nationally. Homes valued between $500,000 and $1 million represent 11% of Park County homes, 5% of homes statewide, and 8% nationally. Conversely, less than 17% of Park County homes are valued under $100,000 as compared to 22% statewide and 25% nationally.

- *Housing Wealth* The higher valued homes translate directly into increased area wealth since homes are the single largest asset for many families and individuals. This also translates into a stronger tax base for local governments and area schools who rely upon property taxes for much of their revenue.

- *Personal Income Growth* The personal income base of the county has been growing at a good pace for a long time and although this slowed in recent years during the recession, recovery more recently has pushed personal income in Park County to an all-time high of $645 million in 2014, measured in inflation-adjusted dollars.

- *Per Capita Income Growth* Personal income on a per capita basis in the county has grown steadily over time, adjusted for inflation, and reached an all-time peak in 2014 of $40,614. This compares with state-wide per capita income of $39,903. The poverty rate in Park County also is lower than state-wide – 12.3 percent versus 15.2 percent. So, economic well-being of county residents exceeds that of the state as a whole using these often-used measures.

- *Labor Income or Earnings* Labor earnings are declining as a share of overall personal income in the county and this should continue as the population ages and more residents reach retirement age. Income from non-labor sources will rise more rapidly and older persons living in the county receiving Social Security, medical program payments, and income from savings and investments, will account for a growing share of area income.

- *"Imported" Labor Earnings* The desirability of living in Park County affects how much labor income is "imported" to the county by residents who work at jobs outside of Park County. Park is a significant net importer of these workplace labor earnings because many residents who work outside of the county choose to live in Park County. These net

additions to labor income accounted for about ten percent of all county labor earnings in 1990, but in 2014 this had grown to over 25 percent. This growth is a reflection of the desirability of living in Park County, even for residents who work at jobs outside of the county.

- *Yellowstone "Gateway"* Park County's economy is significantly impacted by the close proximity of Yellowstone National Park. Highway 89 is one of the primary "gateways" to and from the park. It runs the length of the county from north to south. The Yellowstone River flows into Park County from the park, running alongside Highway 89 through the "Paradise Valley" area in the southern portion of the county. This valley is aptly named, framed by impressive mountain ranges and scenic landscapes and vistas, including views of Emigrant Peak, that are very appealing to visitors and area travelers.

- *Park Visitation* Visitation to Yellowstone National Park was a record level in 2015 with 4.1 million visitors. Average daily traffic (ADT) in July last year also reached a record level at 3,585 vehicles a day. This is an 18 percent increase in traffic over ten-years earlier. This increase represents hundreds of additional vehicles a day moving through the area each summer.

- *Visitor Spending Regionally* When traveling to and from Yellowstone National Park and across Montana, visitors spend an estimated at $3.6 to $3.8 billion annually on fuel, lodging, food, supplies, and other largely traded goods and services. The Institute for Tourism and Recreation Research at the University of Montana estimates spending by non-resident travelers in the 5-county region of Gallatin, Sweet Grass, Stillwater, Carbon, and Park at $970 million annually. This and the economic activity it generates support an estimated 13,520 jobs in the region.

- *Visitor Spending in Park County* Spending by non-resident travelers in Park County alone is estimated at $196 million, or about 20 percent of the 5-county total. Only five counties in Montana are estimated to have more non-resident traveler spending than Park and, on a per capita basis, no major tourism county in Montana has more in non-resident spending that Park, supporting an estimated 2,700 jobs, or about 28 percent of all county jobs.

- *Public Forestlands* Park County is about 2,800 square miles in size and over 1,500 square miles of this total contains some type of federal forest lands. Over half are federally protected "wilderness" areas. These largely natural areas and open lands create a rich and healthy environment for wildlife and help sustain high quality streams and other waters. These natural amenities bring large numbers of anglers, hunters, and other recreationists to the Park County area each year, adding further to those who pass through the area primarily in visiting Yellowstone Park.

- *Anglers and Hunters* The Montana Fish, Wildlife and Parks (MFWP) estimates that resident and non-resident hunters and anglers spend about $1.26 billion each year in the state. These dollars are spent disproportionately in areas where hunting and fishing are best and Park County is one of these areas. The Upper Yellowstone basin or drainage, largely contained within Park, Sweet Grass, and Stillwater Counties, runs the full length of the Paradise Valley, and is the single busiest drainage in all of Montana for sport fishing activity. MFWP estimate the basin accommodates over ten percent of all sport fishing in the state, 374,000 "angler days" in total with three-fourths of this in the summer months. About 64 percent of this is by residents of Montana with the rest by non-residents.

- *Area Hunting* MFWP compiles data on hunting activity across Montana by sub-area and district. Hunter days for elk hunting in districts largely within Park County total 20 to 25 thousand a year. Area deer hunting add another 15,000 or more hunter days to this. There also is significant goat, sheep, and moose hunting in the area.

- *Angler/Hunter Spending* The combined fishing and hunting activity in the area is considerable, as is area spending by anglers and hunters while on trips to the area. Altogether, stream and lake anglers spend an estimated $70 million a year during their fishing trips to the Upper Yellowstone. Hunters spend another $5 to $6 million during their hunting trips in Park County area hunting districts. These dollars flow to area gas stations, car rental businesses, lodging and camping facilities, food stores and restaurants, guide services, and other businesses in the area. This spending represents about $4,000 to $5,000 in additional spending for each resident of the county.

- *Seasonality in Area Employment* Park County employment is greatly affected by area patterns in visitation and traveler activity. County employment reaches highs each year in mid-summer and lows ordinarily in February with swings in employment of over one thousand jobs or about 13 percent. Over time, peak summer employment levels are rising, with the total number of employed reaching a high in 2015 of 8,556 workers.

- *Area Self-employment* The county has an unusually high level of proprietor or self-employment. Self-employed individuals, both on farms and ranches and in a wide range of non-farm businesses, account for almost 40 percent of all jobs in the county as compared to 27 percent state-wide. This is an indication of a high level of area entrepreneurial "energy" as well as that the area has a lot of small businesses. Proprietors are persons who work for themselves and tend to by much more "footloose" or flexible in terms of where they can choose to live and work. The higher percentage of proprietorships in Park County is partly because these persons want to live in the area and this is a function of the quality of life and area amenities.

- *Areas of Concentrated Employment* Of all the sectors of the economy, "accommodations and food services" which includes all lodging and eating businesses has the highest employment in the county. This is not surprising given the areas high levels of visitation. Retail trade more broadly is the second largest employer. Prior to the recession which had its greatest impact in 2009 and 2010, Park County had most of its employment growth in sectors affected by area travel and tourism. In the post-recession period up until the present, the biggest job growth has been in accommodations and food services, again reflecting this dependency on spending by travelers and visitors. Five of the seven areas of greatest job growth more recently are somewhere in traded goods and services including accommodations and food, arts and recreation services, retail trade more generally, and wholesale trade..

- *Travel and Tourism Boosted Trade* These dominant sectors in trade have grown in labor earnings from a little over $30 million in 1985 to over $60 million today and labor earnings paid to those employed in accommodations and food service reached an all-time high of $35 million in 2014. These trade sectors are heavily impacted by travel, tourism, and area recreation activity and account for over 22 percent of all labor income in the county – a relatively high percentage that reflects the area's dependence on these activities.

- *Construction* The construction sector ranks fourth in the county in labor earnings at $22.4 million. This is down considerably from a high in 2006 of $35 million. This sector stabilized in 2010 and has begun to grow once again with the larger share of area residential construction tied to part-time residents of the county, drawn to the area by quality of life and area amenities.

- *Area Agriculture* Park County has a stable agricultural sector that includes 564 farms and ranches, 93 of which are greater than 2,000 acres in size. Contained within these are 774,000 acres of land, both owned and leased, representing about 45 percent of the entire county land area. A full 608,000 acres are in some type of pasture, further adding to the expansiveness and allure of the area's landscapes and environmental quality. These ag lands support 44,000 cattle and about 2,600 sheep. Gross receipts from livestock sales total over $30 million a year. Crop receipts add another $15 million, with these gross receipts spread across a range of categories including livestock purchases, feed costs, fuel, and hired labor; the latter estimated at over $10 million annually.

- *Chief Area Economic Strengths* Park County's economic strengths are derived from a stable and growing population, added to by a growing number of part-time residents who own homes in the area. Combining with this is a large and growing number of visitors to the area, for fishing and hunting and traveling to Yellowstone Park and other area attractions. These combine to grow and sustain the area economy, expanding area trade beyond levels sustainable only by residents of the county and adding to area construction. The heart-beat of the Park County economy closely reflects the flow of visitors to the area and the growing presence of retirees and part-time residents.

- *Chief Area Economic Threat* The chief threat to area quality of life and economic well-being would be any activities that could significantly negatively impact area amenities, environmental attributes, and quality of life because these are the things that distinguish the area and have contributed so heavily to area economic health and vitality. Any highly visible and environmentally disruptive activity, like large-scale mining or large-scale industrial activity, that can impact the area both substantively in terms of air, water, and land quality, and perceptually, reducing the area's image as a high quality place to live and visit, would have the greatest potential to cause long-term area economic impairment.

Park County is blessed with a strong combination of high quality area amenities, proximity to the nation's first national park, a steady and lasting stream of visitors and travelers to the area, a seemingly high level of proprietor employment, entrepreneurial energy and can-do spirit, and a relatively large proportion of its workforce employed in occupations that require "creative skills". It has a strong economy that continues to grow in sustainable and enduring ways, with many aspects of this economy tied to area amenities and quality of life.

---

* Larry Swanson is a Ph.D. economist and Director of the O'Connor Center for the Rocky Mountain West at the University of Montana. In his more than 40 years of work as a professional economist, Swanson has done hundreds of studies of regional, sub-regional, and area economies throughout the larger region, work funded by major foundations, economic and community development organizations, governmental agencies, and private companies and firms. Between 2006 and 2007 he conducted a detailed study for the Yellowstone Business Partnership of the 25-county region surrounding Yellowstone National Park, which is cited throughout this report. This study involves a focused examination of one of these counties; Park County, Montana, and its area economy. This report was funded by private funders and undertaken through contracting with the Greater Yellowstone Coalition.

[1] Swanson, Larry, "Growth and Change in the Yellowstone-Teton Region," prepared for the Yellowstone Business Partnership (YBP), March, 2007

[2] McGranahan, David, Wojan, Timothy, and Lambert, Dayton, "The rural growth trifecta: outdoor amenities, creative class and entrepreneurial context," Journal of Economic Geography, May, 2010, As they concluded through detailed statistical analyses, "Tests confirm that the interaction of entrepreneurial context with the share of the workforce employed in the creative class is strongly associated with growth in the number of new establishments and employment, particularly in those rural counties endowed with attractive outdoor amenities." (underlining added) "Our study treats entrepreneurial context (small firm size or self-employment rate) as a local attribute distinct from the creative class. We expect that creative class and entrepreneurial context have a synergistic effect on local growth." (p. 5) "Moreover, the synergistic effects of entrepreneurship and creative class will be greater in higher amenity areas where it is easier to attract footloose businesses, creative and skilled labor and where the amenities themselves may be a source of growth." (p. 7) Outdoor amenity measures chosen reflect climate, landscape (including terrain, water, forests, etc.), and recreation appeal (tourism and other associated recreation activity).

[3] Swanson, Larry, and Janssen, Hayden, "Natural Resource and Environmental Restoration in Montana – Case Studies in Restoration and Associated Workforce Needs," report to the Montana State AFL-CIO with funding by the U.S. Department of Labor, O'Connor Center for the Rocky Mountain West, University of Montana, August, 2012. Study overview at: http://crmw.org/Downloads/Restoration%20Study%20Overview.pdf and mining case studies at: http://crmw.org/Downloads/Restoration%20Studies%2020-27R.pdf

This 2012 restoration study found: "Across Montana are thousands of sites where natural resources and environments have been badly damaged and degraded and where existing contamination lingers and spreads. [...] Complete restoration oftentimes is not a realistic objective because the costs involved in achieving total restoration are simply too high. Other times there may be gaps in laws governing such cleanup, or in their enforcement, that result in much lower levels of restoration." [p. 2]

The study found that considerable large-scale natural resource damage and environmental contamination simply goes unaddressed because of lack of resources and gaps in programming, noting: "[T]he Montana Department of Environmental Quality administers the federal Brownfield's program aimed at identifying and eventually cleaning up sites with significant contamination of hazardous materials and substances. It has been able to fund about 25 assessments of these kinds of sites in Montana, but admits that there are probably hundreds of potential Brownfield contamination sites across Montana where significant contamination is known or suspected (MDEQ web site). Under its Abandoned Mine Reclamation program MDEQ has completed reclamation work at 408 coal mines and 38 hard-rock mines, but more than 1,500 abandoned mine sites have been identified and assessed under the program, occurring in 16 counties." [p. 3]

Regarding use of the large Superfund program for cleaning up major contamination sites, the study found: "Up to 294 sites across Montana were given some consideration for possible cleanup under federal and state Superfund programming [...] Superfund sites are ones where contamination is particularly widespread and large scale. Two hundred and nine (209) of these remain under consideration, with six listed as maximum priorities, 53 as high priorities, and 74 as medium priorities. While only four sites are now listed as requiring "no further action" only 32 are under "active management" (MDEQ "Site Response Section Statistics Report," January, 2011). So, much work remains to be done and work on these sites will continue many years into the future." [p. 3]

The study concludes: "In a state that prides itself on not only the quantity of its natural surroundings and environmental amenities but also their quality, these conditions where degradation and contamination are often allowed to persist and expand are unacceptable. In the past many contamination sites and areas of land degradation have gone almost unnoticed and unattended, sometimes because of the shear abundance of the states' natural resources and the remoteness of their locations. Early testing for contamination at many sites has been sometimes too limited and confined to fully expose the problems. Damage and contamination persist also because the costs of restoration are high, so high that true restoration – returning damage environments to near pre - existing conditions – is seldom if ever achieved even when attempted. Damage persists because government programs and the funding they may bring to these problems are often inadequate to the shear magnitude of the tasks involved. Damages persist because the private incentives for cleanup and restoration usually pale in relation to the monetary incentives leading to the exploitation and damage of resources and associated environments. And damage persists because responsible parties sometimes cannot be found or no longer exist as business entities." [p. 4] Because of the legacy of past large-scale industrial activity causing massive contamination across the state and region, great care needs to be exercised when deciding if and where such activities can and should go forward in the future to avoid both environmental and economic impairment in affected areas in the future.

[4] Swanson's studies on amenity-based growth in the West and in Montana, including growth nearby national parks, include a study in 2003 reporting upon amenity-driven growth in the Glacier Park area ("Gateway to Glacier," report to the National Parks Conservation Association, and a 2007 study report for the Yellowstone Business Partnership. The 2007 YBP study identifies counties nearby both national parks and national forest lands in the West (page 10), which includes Park County, and shows charts on population trends in these areas nearby these federal lands (page 12), concluding that increased growth in both urban and rural areas nearby these lands is, in part, "amenity-driven," spurred by the high quality of life many increasingly associate with areas and communities nearby parks and federal forest lands. Even earlier work by Swanson on this subject is published in *The Rocky Mountain West's Changing Landscape*, Vol. 2, No. 2, Winter/Spring 2001, "The West's Forest Lands – Magnets for New Migrants and Part-time Residents," published by the O'Connor Center for the Rocky Mountain West, Univ. of Montana. Here it is noted: "Expansive tracts of public forest lands are [...] becoming more important economically because of the high values increasing numbers of people attach to the amenities associated with these forest lands."

Studies reported in 2016 by economist Ray Rasker and others with Headwaters Economics ("Federal Lands in the West: Asset or Liability"", February, 2016) state that "western rural counties with the highest share of federal lands on average had faster population, employment, personal income, and per capita income growth than their peers with the lowest share of federal lands." http://headwaterseconomics.org/public-lands/federal-lands-performance What's more they found areas with federal lands with the most protection (such as National Parks and federally-designated wilderness areas), had better economic performance than areas with less protected lands. They attribute this to the ways in which natural amenities on these lands serve to attract and retain residents, retirees with non-labor income, part-time residents (such as ones with second homes in these high amenity areas), and tourists and recreationalists. Together the increased presence of these types of residents and visitors serves to spur more retail and services growth, where much of the growth in the U.S. economy as a whole has been concentrated. Conversely, they find that rural areas without these lands and amenities struggle to retain their populations.

Studies by economists with the Kansas City Federal Reserve Bank on population and economic growth in rural areas of the U.S. found that "natural resources" are important factors in growth, but not in the same ways as in the past when this was largely through their extraction. "Many rural areas with natural resources continue to grow. The growth, however, is not being driven by resource extracting industries that have actually declined, but by the high quality of life associated with natural amenity areas. People visit and move to natural resource areas to enjoy the amenities they offer." ("Natural Amenities and Rural Employment Growth: A Sector Analysis," Jason Henderson, Kansas City Federal Reserve, and Kendall McDaniel, Chickasha Bank & Trust Company, *Review of Regional Studies,* Vol. 35, No. 1, 2005, pp. 80 – 96). There are many other studies with similar findings.

[5] Institute for Tourism and Recreation Research, University of Montana, "Relocation to Montana: Current Residents Who Were Influenced by Previous Vacations or Seasonal Tourism Jobs to Move to the State," Research Note 2015-2 http://www.itrr.umt.edu/files/MovedtoMontana-VacationandJobInfluence.pdf

[6] You can access and review work by the Economic Research Service of the U.S. Department of Agriculture at their web site at < http://www.ers.usda.gov/topics/rural-economy-population/natural-amenities.aspx>. This includes documentation and data regarding both high amenity areas of the U.S., as designated by ERS, and rankings with regard to the presence of "creative class" jobs in local areas.

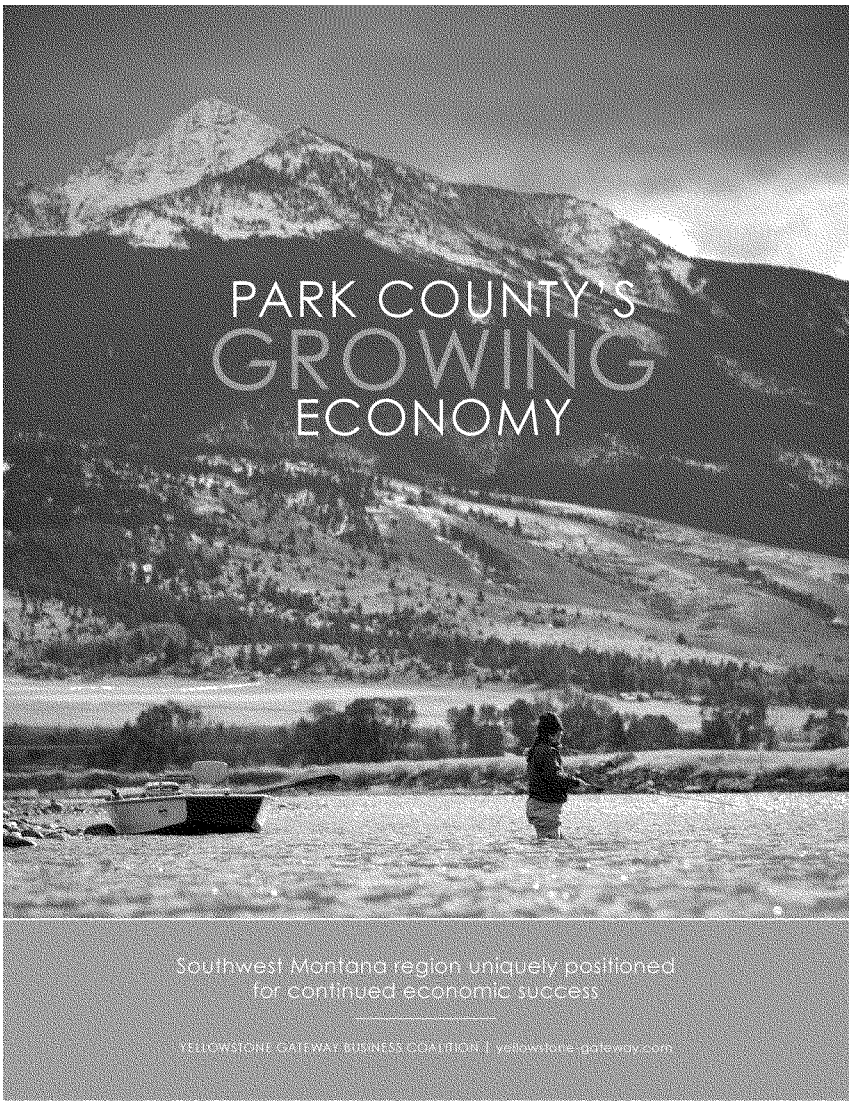
[7] Richard Florida's work on the importance of the "creative class" in the modern U.S. economy can be explored on the web site he developed that is dedicated to this subject at < http://www.creativeclass.com/>. His best-selling book on this subject is entitled, "Rise of the Creative Class," published in 2002.

[8] Documentation of detailed occupations used by the Economic Research Service in tabulating employment by U.S. county on creative class jobs is at <http://www.ers.usda.gov/data-products/creative-class-county-codes/documentation.aspx

[9] Institute for Tourism and Recreation Research, University of Montana, "Preliminary 2015 Non-resident Traveler Expenditures and Economic Contribution," available on the ITRR web site at < http://www.itrr.umt.edu/files/Preliminary%202015%20Spending%20and%20Impacts.pdf>

[10] Institute for Tourism and Recreation Research, University of Montana, Kara Grau, M.S., "2014 Economic Contribution of Nonresident Travel Spending in Montana Travel Regions and Counties," 7/24/2015

[11] Montana Fish, Wildlife & Parks (MFWP), "Statewide Estimates of Resident and Nonresident Hunter and Angler Expenditures in Montana (2014)," HD Unit Research Summary No. 39, Helena (Michael Lewis and Zoe King).


PARK COUNTY'S
GROWING
ECONOMY
Southwest Montana region uniquely positioned
for continued economic success
YELLOWSTONE GATEWAY BUSINESS COALITION | yellowstone-gateway.com

NEXUS OF ATTRIBUTES FUEL PARK COUNTY'S LONG-TERM ECONOMIC GROWTH

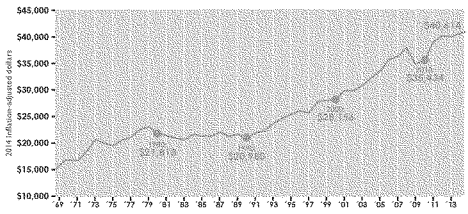
By virtually every measure, the economy of Park County is growing and expanding compared to other rural communities across Montana and all over the United States. Park County possesses a potent combination of high-quality area amenities as well as other beneficial socioeconomic attributes. These include proximity to the nation's first national park (Yellowstone), which continues to generate an escalating (record-breaking in 2015) stream of visitors and travelers from all over the U.S. and around the world. This has helped the area's economy continue to ramp upward over the past four decades and fuel a diversity of economic sectors. Add to this a high level of proprietor employment, entrepreneurial energy, and a large proportion of the workforce employed in occupations requiring creative skills. The result is an unusually vibrant economy that continues to grow in enduring, measurable ways.

Park County does share a few of the same challenges as the rest of rural America, such as relatively flat population growth, but the presence of spectacular public lands and waters gives the region a natural competitive advantage for continued economic growth. Along with growing wealth, friendly communities, and deep agricultural roots, these natural assets give Park County leverage to attract people, businesses, and investments while sustaining the way of life that residents enjoy.

SIGNS OF SUCCESS

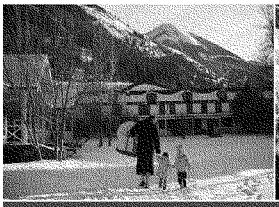
- Park County ranks #1 in Montana in non-resident traveler expenditures among major destination counties *(per capita)*.
- Unemployment hit a low of 3.6% in July 2015 *(compared to 5.3% nationwide)*.
- Personal income base of Park County recently hit an all-time high of $645 million.

FIG. 1: PER CAPITA INCOME OF PARK COUNTY RESIDENTS OVER TIME, 1969-2014 *Source: BEA, U.S. Dept. of Commerce*



"Chico Hot Springs Resort has been in business for over a 100 years, and I'm pleased to report we're coming off our best year ever. We employ over 170 locals, providing a sustainable livelihood that supports families throughout Park County."

~Colin Davis,
owner Chico Hot Springs Resort



PHOTOS COURTESY OF: Cover: Brian Grossenbacher; Inside Cover (left to right): Lynn Donaldson Photography, Lynn Donaldson Photography

A COMPETITIVE ADVANTAGE

THE PARK COUNTY ECONOMIC TRIFECTA

Studies by economists with the U.S. Department of Agriculture's Economic Research Service (ERS) indicate that Park County's economic growth and stability is capitalizing on three area attributes:

1. **A high proportion of persons employed in creative occupations**
2. **Highly ranked area amenities and recreational resources**
3. **A strong setting for entrepreneurial initiative**

The ERS refers to these three attributes as the trifecta for positive rural development, and they appear to be core strengths of the Park County area economy.

A Thriving Creative Class

A growing number of economic studies are pointing out the importance of jobs requiring creative types of work in an economy increasingly shaped by information, knowledge, art, and ideas. ERS studies indicate that Park County has 23.5 percent of its employment in designated creative class occupations, scoring it in the top 6 percent of non-metro counties nationwide.

> **Park County ranks in the top 6% among more than 2,000 non-metro counties nationally for creative class employment.**

Natural Amenities and Area Economic Growth

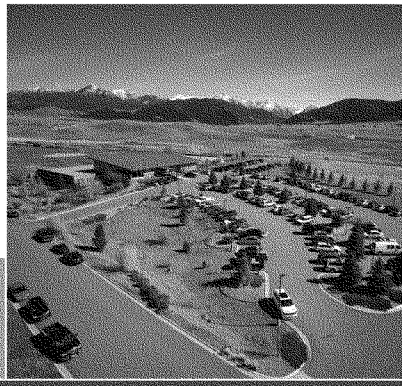
Recent trends in area economic growth more fully affirm the strong connection between area economic vitality and the quality of natural amenities and quality of life. The ERS website states, "The rural outdoors has become a major asset for rural communities." Without question, the spectacular public lands surrounding Park County give the region a natural competitive advantage. For example, in counties with at least $100 million of non-resident travel expenditures, Park County brings in more money per resident than any other.

A Fertile Setting for Entrepreneurs

Proprietor or self-employment represents a significant portion of employment in Park County, accounting for 39% of all jobs in 2014. This figure has grown by about one-third in the last decade. Statewide in Montana, proprietors accounted for 27% of all jobs in 2014, up only slightly from 26% in 2000. Park County's significantly higher percentage of self or proprietor employment is interpreted as an indication of entrepreneurial energy.

"As a startup looking to open our brewery in 2014, we relied heavily on Yellowstone and Park County visitation numbers to support our new business plan. Quite frankly, our plan would not have penciled had we not factored these powerful tourism statistics."

—LaNette & Brice Jones, owners Katabatic Brewery



> Proprietors with a significant number employment may locate their business in Park County due to the area's quality of life amenities. BEA reports over 2,000 full time equivalents with a minimum working salary of approximately $40k.
>
> *—Richard Rosenzweig*

NATURAL ASSETS ARE ECONOMIC ASSETS

PARK COUNTY'S GROWING ECONOMY

By virtually every measure, the Park County area economy is growing. The personal income base of the county recently reached an all-time high of $645 million (measured in inflation-adjusted dollars). Per capita income also reached an all-time high of nearly $41,000, which compares with a statewide level of $39,900.

> **By virtually every measure, the Park County area economy is growing.**

The area's labor force continues to grow, as does area employment. Because of the area's attractiveness and quality of life, considerably more labor earnings are imported into the county from residents working outside of Park County who continue to live in the county. This now accounts for 25 percent of all labor earnings by county residents.

Personal income is the single most-used measure of the size of an area economy. It includes all income received by households and individuals (residents of the county only) in any form, including wage and salary receipts, proprietor profits, and/or income from other sources. The total personal income of residents of Park County has been growing at a steady pace for a very long time. In 2016, residents of Park County are making more money than they ever have before.

PARK COUNTY'S LOW UNEMPLOYMENT

Since 2010 the county's unemployment rate has shrunk, dipping to as low as 3.6% in 2015. Park County employment is affected by area patterns in visitation and traveler activity. At the current rate, unemployment could fall as low as 2% by 2017. When unemployment falls below three percent in any area, this can be considered a very tight labor market and there will be increasingly situations where there are not enough workers available for all jobs.

PARK COUNTY'S DIVERSE ECONOMY

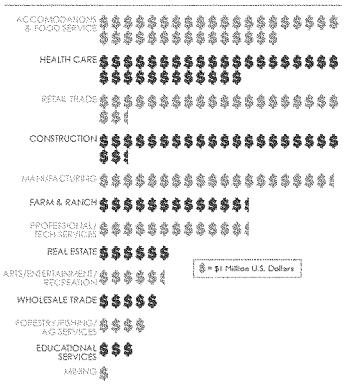
The steadily growing economy of Park County rests on the foundation of a diverse services economy. Total employment, which includes all full and part-time jobs, occurs across more than 20 different sectors of the economy.

The sector with the single-highest level of total employment in the county is accommodations and food services, which includes all types of lodging (hotels, motels, B&Bs, resorts, etc.) as well as restaurants, cafes, bars, etc. This #1 sector is closely buttressed by the #2 retail trade sector, which also heavily caters to and is bolstered by travelers. Consumer spending drives all the various trade sectors: arts, entertainment, and recreation. Both visitors and residents alike affect these thriving economic sectors.

The farm & ranch sector, a steady contributor to Park County's economy, has seen growth in recent years. Gross receipts from livestock sales total over $30 million a year. Crop receipts add another $15 million, with these gross receipts spent across a range of categories including livestock purchases, feed costs, fuel, and hired labor, the latter estimated at over $10 million annually.

The chart below shows total labor earnings by economic sector in 2014 for Park County.

FIG. 2: PARK COUNTY LABOR EARNINGS BY MAJOR SECTOR, 2014
Source: BEA, U.S. Dept. of Commerce



PARK COUNTY BY THE NUMBERS

- **$196 MILLION** in non-resident tourism revenues in 2014.
- **ONE** and only year-round driving entrance to Yellowstone Nat. Park.
- **20** different economic sectors fuel a diverse economy.
- **2,800 square miles**, just over half being National Forest Land
- **TOP 6%** - non-metropolitan nationwide – in possessing a thriving "creative class."
- **$70 MILLION** a year in direct spending from fishing industry alone.
- **4.1 MILLION** visitors to Yellowstone National Park in record-breaking 2015, a **13% INCREASE** since 2010.
- **564** farms and ranches.
- **22%** of all labor income fueled by travel, tourism, and recreation.

SUNSET FOUR-HORSE PACK TRIP, LAMAR VALLEY, YELLOWSTONE NAT. PARK. Photo by Jim Peaco, National Park Service

HEARTBEAT OF PARK COUNTY ECONOMY REFLECTS THE FLOW OF VISITORS & SPORTSMEN TO THE REGION

TRENDS IN VISITATION TO YELLOWSTONE NATIONAL PARK

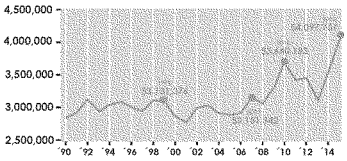
Proximity to Yellowstone National Park has heavily influenced the visibility and economic success of Park County. Park County has the only year-round driving entrance into the Park. As the economy has rebounded in the past five years, the trend in increased visitation to Yellowstone Park has surged and the park had a record 4.1 million visitors in 2015 – a 13 percent increase from 2010 levels (the previous record year for visitation).

During this same time the average daily traffic (July, 2015) at the northern gateway to the park on Highway 89 was 3,585 vehicles a day. This is an increase of 549 vehicles on average each day over the level in July ten years earlier or an 18 percent increase in traffic.

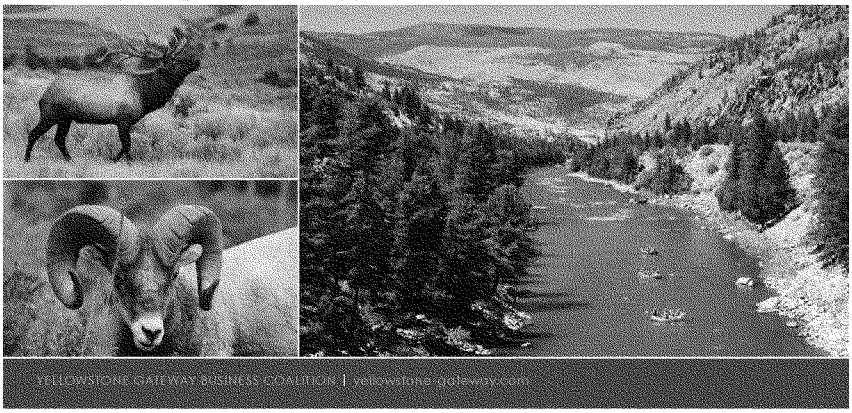
NON-RESIDENT TRAVELER SPENDING IN PARK COUNTY

Statewide spending by non-resident visitors averaged $3.8 billion in 2013 and 2014. Park County, with its desirable public lands, crown jewel national park, and well-developed tourism infrastructure, reaped its share of these revenues, which feed many sectors of the local economy. It is estimated that Park County alone captured $196 million per year of these tourism revenues. This represents approximately 2700 jobs. In terms of non-resident traveler expenditures per capita, Park County ranks higher than every other major tourism county in the state at $12,400 per resident.

FIG. 3:
TOTAL RECREATION VISITS TO YELLOWSTONE NATIONAL PARK, 1990-2015
Source: Institute for Tourism & Recreation Research, U. of Montana



PHOTOS COURTESY OF (clockwise from top): Mike Harrelson, Paradise Adventure Company, Mike Harrelson



"FISH ON" - NATURAL AMENITIES AND AREA ECONOMIC GROWTH

Research and supporting statistics show that Park County's competitive economic advantage is based, in large part, upon the natural assets of the area. Fishing in the county is a primary driver.

Fishing jobs and related revenues are booming. The Upper Yellowstone River alone fuels $70 million a year in direct expenditures, the majority of which runs through Park County.

Expenditures by river/stream anglers on the Upper Yellowstone:

- 191,143 resident angler days at $80.51 per day equals $15.4 million in annual spending.
- 120,203 non-resident angler days at $385.30 per day equals $46.3 million in annual spending.

This is a total of almost $62 million a year in expenditures by both residents and non-residents fishing in Upper Yellowstone rivers and streams.

Expenditures by lake anglers on the Upper Yellowstone:

- 48,870 resident angler days at $87.36 per day or $4.3 million in annual spending.
- 14,067 non-resident angler days at $280.78 per day or $3.9 million in annual spending.

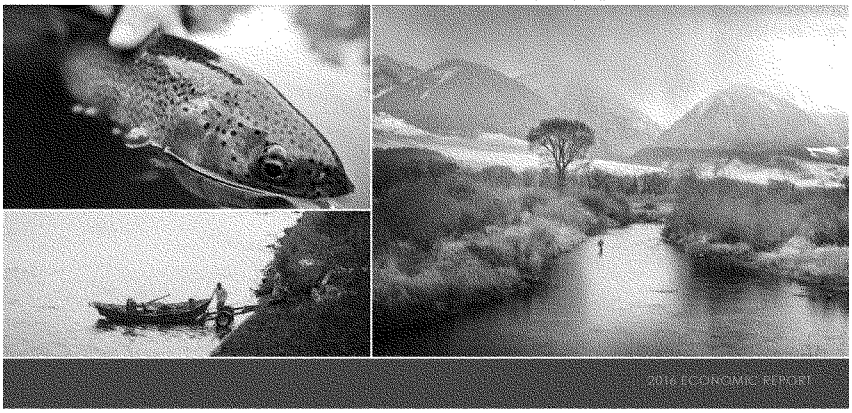
For area lake fishing, the total annual spending is $8.2 million for the Upper Yellowstone.

These stream and lake anglers who fish in the Upper Yellowstone River drainage spend an estimated $70 million a year. These dollars flow to area gas stations and car rental businesses, lodging and camping facilities, food stores and restaurants, guide services, and other retailers and service providers. They represent about $4,700 in additional spending for each resident of Park County. This spending is generated and sustained by high-quality area natural resources and environmental amenities that provide for large, healthy wildlife populations and fisheries. And area businesses benefit enormously from this spending year after year on a sustained basis.

"As a fishing guide with almost 30 years of experience in the Yellowstone valley, I'm proud to be a part of an industry that contributes substantially to the local economy while minimizing our effect on the resources we all enjoy."

~Brant Oswald, owner Brant Oswald Fly Fishing Services

PHOTOS COURTESY OF (clockwise from top): iStockPhoto.com, Brian Grossenbacher, Brian Grossenbacher



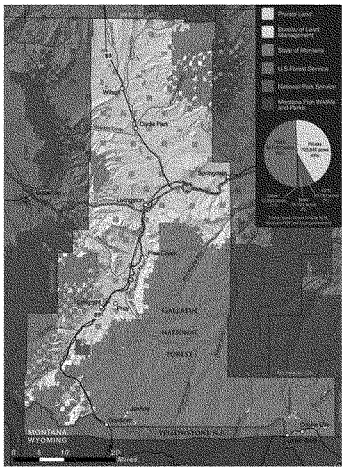
LEVERAGING PARK COUNTY'S STRENGTHS TO SUSTAIN ECONOMIC GROWTH AND REGIONAL STABILITY

While Park County's population has remained relatively stable over the past twenty years, other economic factors have converged to position the area for future prosperity. Park County is blessed with a strong combination of high-quality area amenities, proximity to the nation's first national park, a steady and lasting stream of visitors and travelers to the area, a seemingly high level of proprietor employment, entrepreneurial energy, and a relatively large proportion of the workforce employed in occupations that require creative skills. The area has a strong economy that continues to grow in sustainable, enduring ways, with many aspects of this economy tied to the area's amenities and quality of life.

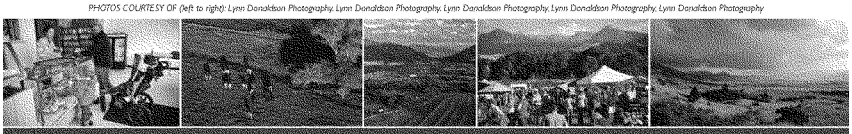
The chief threat to area quality of life and economic well-being would be any large-scale activities that negatively impact area amenities and environmental attributes that are the foundation of the area's economic vitality. Large-scale, highly visible, and environmentally disruptive activities – such as large-scale mining and heavy manufacturing – may pose the greatest threats, and could lead to long-term area economic impairment and future economic stagnation. While large-scale industrial activities do bring jobs, employment earnings, and income to an area, these benefits are often short-term or transitory while their negative impacts are deep, continuing sometimes in perpetuity.

Economic stability and intact landscapes give Park County a unique opportunity to maintain things the way they are, and continue to build a healthy and stable economic future.

FIG. 4: PARK COUNTY, MONTANA
Source: Atlas of Park County Montana, 2013, land ownership map



PHOTOS COURTESY OF (left to right): Lynn Donaldson Photography, Lynn Donaldson Photography, Lynn Donaldson Photography, Lynn Donaldson Photography, Lynn Donaldson Photography



Yellowstone IS MORE VALUABLE THAN GOLD

YELLOWSTONE GATEWAY BUSINESS COALITION

The Yellowstone Gateway Business Coalition is a pro-business, pro-property rights group representing thousands of hardworking employees and their families throughout Park County, Montana. yellowstone-gateway.com

This summary is based on a 2016 study by Dr. Larry Swanson, economist and director of the O'Connor Center for the Rocky Mountain West at the University of Montana, entitled 'Key Trends, Dependencies, Strengths and Vulnerabilities in Park County, Montana, and its Area Economy.'