

Comprehensive Conservation Plan

Red Rock Lakes National Wildlife Refuge

June 2009

Prepared by

U.S. Fish and Wildlife Service

Red Rock Lakes National Wildlife Refuge
27650B South Valley Road
Lima, MT 59739
406/276 3536

and

U.S. Fish and Wildlife Service, Region 6
Division of Refuge Planning
134 Union Boulevard, Suite 300
Lakewood, CO 80225
303/236 8145

Approved by



Steve Guertin

Date

Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, CO

Contents

<i>Summary</i>	iii
<i>Abbreviations</i>	vii
1 Introduction	1
1.1 Purpose and Need for the Plan	3
1.2 Early History of Conservation.....	3
1.3 U.S. Fish and Wildlife Service and the Refuge System.....	4
1.4 National and Regional Mandates.....	5
1.5 Refuge Contributions to National and Regional Plans	6
1.6 Ecosystem Description and Threats	10
1.7 Planning Process	12
2 The Refuge	17
2.1 Establishment, Acquisition, and Management History	17
2.2 Special Values of the Refuge	25
2.3 Purposes	26
2.4 Vision.....	26
2.5 Goals	26
2.6 Planning Issues.....	27
3 Refuge Resources and Description	35
3.1 Physical Environment	35
3.2 Biological Resources	44
3.3 Cultural Resources	55
3.4 Special Management Areas	56
3.5 Public Uses.....	59
3.6 Socioeconomic Environment	60
3.7 Operations	63
4 Management Direction	67
4.1 Management Focus.....	67
4.2 Goals, Objectives, Strategies, and Rationale	68
Lake, Pond, and Marsh Habitat Goal.....	68
Riparian Habitat Goal	75
Wet Meadow, Grassland, and Shrub-steppe Habitat Goal.....	80
Aspen Forest, Mixed Coniferous Forest, and Woodland Habitat Goal	86
Visitor Services and Cultural Resources Goal	87
Refuge Operations Goal	92
4.3 Staffing and Funding	94
4.4 Step-down Management Plans.....	94
4.5 Partnership Opportunities.....	95
4.6 Monitoring and Evaluation.....	95
<i>Glossary</i>	97

Appendices

A Public Involvement.....	103
B Key Legislation and Policies.....	127
C Section 7 Biological Evaluation.....	131
D Preparers.....	135
E Environmental Compliance.....	137
F Compatibility Determinations.....	141
G Species Lists.....	159
H Fire Management Program.....	183

<i>Bibliography</i>	187
---------------------------	-----

Figures

1 Location of Red Rock Lakes National Wildlife Refuge, Montana.....	2
2 Physiographic area map of the United States. Red Rock Lakes National Wildlife Refuge lies within physiographic region 64.....	7
3 Upper Missouri, Yellowstone, and Upper Columbia rivers ecosystem map.....	11
4 CCP and environmental analysis process steps.....	12
5 Red Rock Lakes National Wildlife Refuge approved acquisition boundary and acquired lands—refuge base map.....	20
6 Conservation easements within the Centennial Valley.....	24
7 Significant declines in annual, December, and January precipitation totals between 1948 and 2005.....	37
8 Mean annual, March, and April air temperatures at Lakeview, Montana, between 1949 and 2005. Significant increases are shown for the months of March and April.....	38
9 Representative flow rates for Red Rock, Odell, and Tom creeks at Red Rock Lakes National Wildlife Refuge.....	42
10 Habitat types found in Red Rock Lakes National Wildlife Refuge.....	45
11 Vegetation classifications found in Red Rock Lakes National Wildlife Refuge.....	47
12 Wetland types found in Red Rock Lakes National Wildlife Refuge.....	49
13 Designated wilderness within the acquisition boundary of Red Rock Lakes National Wildlife Refuge.....	57
14 Public use areas to be implemented at Red Rock Lakes National Wildlife Refuge.....	61
15 Intra-annual moose abundance on Red Rock Lakes NWR, 1983–1985.....	77
16 Adaptive management process.....	95

Tables

1 Planning process summary for Red Rock Lakes National Wildlife Refuge.....	13
2 Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2008.....	21
3 Conservation easement acquisition history within the Centennial Valley, 2001–2008.....	25
4 Current base funded staff at Red Rock Lakes National Wildlife Refuge, Montana.....	63
5 Nesting and foraging requirements for the five most commonly detected bird species in willow riparian habitat at Red Rock Lakes National Wildlife Refuge, Montana....	79
6 Habitat requirements for target wet meadow bird species.....	81
7 Habitat requirements for target shrub-steppe and grassland, and Centennial Sandhills bird species.....	83
8 Current and proposed staff, Red Rock Lakes National Wildlife Refuge, Montana.....	94
9 Step-down management plans for Red Rock Lakes National Wildlife Refuge, Montana.....	94

Summary



Angler on Odell Creek.

The following summary provides a brief overview of this final comprehensive conservation plan for Red Rock Lakes National Wildlife Refuge, including (1) a general description, (2) purposes of the refuge, (3) vision and goals, (4) the planning process, and (5) outcomes of the plan.

THE REFUGE

On April 22, 1935, President Franklin D. Roosevelt established Red Rock Lakes Migratory Waterfowl Refuge (later named Red Rock Lakes National Wildlife Refuge on July 19, 1961). During the 74 years since the executive boundary was established, the U.S. Fish and Wildlife Service has continued to acquire lands by purchase from willing landowners and acceptance of donations. The Service currently owns 48,955 acres.

This refuge is one of the most remote in the contiguous United States. It is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima. This 48,955-acre refuge sits at 6,670–9,400 feet above sea level and lies east of the Continental Divide near the uppermost reach of the Missouri drainage.

Historically, management focused on protecting and enhancing the trumpeter swan population at the refuge. In the 1930s, the refuge and surrounding area was their last known breeding location.

Service efforts to protect and expand the population included winter feeding, transferring swans to other suitable habitats, managing wetland habitats for breeding swans, and minimizing illegal harvest and disturbance (especially during breeding). Today, swans actively breed and nest on the refuge. Intensive population enhancement efforts such as winter feeding and translocations are no longer necessary or appropriate for species conservation, and have been phased out. The refuge continues to focus on providing quality wetland habitats for nesting swans. This has resulted in a steady increase in the number of trumpeter swans in the Centennial Valley since the mid-1990s. The important role these magnificent birds played in establishing this refuge is outlined in greater detail within this document.

The refuge has some of the most naturally diverse habitats in the National Wildlife Refuge System. The refuge boasts the largest wetland complex within the Greater Yellowstone Ecosystem, as well as expansive tracts of grassland and sagebrush-steppe habitats, and a small amount of midelevation forested areas. These habitats support over 230 species of birds, including peregrine falcons, bald eagles, short-eared owls, sandhill cranes, sage grouse, and numerous species of waterfowl and waterbirds. Common mammals include Shiras moose, Rocky Mountain elk, mule and white-tailed deer, badger, coyote, and red fox. In addition, wolves and grizzly bears have been documented using the refuge in recent years. There is also a remnant population of endemic adfluvial (a

population that lives in a lake and breeds in a river) Arctic grayling that occur on the refuge.

A full-time staff of five employees and various temporary employees manage and study the refuge habitats and maintain visitor facilities. Domestic livestock grazing and prescribed fire are the primary management tools used to maintain and enhance upland habitats. Currently, four grazing cooperators are using refuge lands. Water level manipulation occurs in some areas of the refuge to improve wetland habitats.

Approximately 12,000 people visit the refuge annually. Two refuge roads and three county roads that pass through the refuge account for the majority of visitor use. The refuge is open to limited fishing, with the majority of fishing occurring on Red Rock Creek. In addition, the refuge is open to limited hunting of ducks, geese, coots, elk, pronghorn, moose, and mule and white-tailed deer.

REFUGE PURPOSES

Every refuge has a purpose for which it was established. The purpose is the foundation upon which to build all refuge programs, from biology and visitor services, to maintenance and facilities. No uses of a refuge may be allowed if they are determined to materially detract from or interfere with the purposes for which the refuge was established or the mission of the Refuge System. The refuge purpose is found in the legislative acts or administrative orders that provide the authorities to either transfer or acquire a piece of land for a refuge. Over time, an individual refuge may contain lands that have been acquired under a variety of transfer and acquisition authorities, giving a refuge more than one purpose. The goals, objectives, and strategies identified in this final comprehensive conservation plan are intended to support individual purposes for which the refuge was established.

The legislative purposes for Red Rock Lakes National Wildlife Refuge include the following:

1. "As a refuge and breeding ground for wild birds and animals." (Executive Order 7023, dated April 22, 1935)
2. "For use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (Migratory Bird Conservation Act 1929)
3. "Suitable for (a) incidental fish and wildlife-oriented recreational development, (b) the protection of natural resources, (c) the conservation of endangered species or threatened species ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors." (Refuge Recreation Act 1962)

4. "The conservation of the wetlands of the nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions." (Emergency Wetlands Resources Act 1986)
5. "For the development, advancement, management, conservation, and protection of fish and wildlife resources ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude." (Fish and Wildlife Act 1956)
6. "Wilderness areas ... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." (Wilderness Act 1964)

VISION STATEMENT

The vision for Red Rock Lakes National Wildlife Refuge is based on the establishing purposes of the refuge, resource conditions and potential, and the issues identified during the planning process (see Section 2.2).

The majestic Centennial Valley of southwest Montana is an expansive mosaic of high-elevation wetlands, grasslands, shrublands, and forests framed by dramatic mountain peaks. Through partnerships and conservation programs, the valley has maintained its biological integrity and is a working landscape that remains largely undeveloped.

To this end, Red Rock Lakes National Wildlife Refuge is a conservation leader in the valley working to maintain, mimic, and where appropriate, restore natural processes to create and sustain native habitat for migratory and resident fish and wildlife. Visitors have a sense of solitude and wildness that lifts their spirits and stirs their souls. This first-hand experience with the refuge encourages people to participate as stewards, not only of the refuge, but also of the natural resources in their own communities.

GOALS

The goals described below help the staff achieve the vision for Red Rock Lakes National Wildlife Refuge.

LAKE, POND, AND MARSH HABITAT GOAL

Provide habitat for breeding and staging migratory birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.

RIPARIAN HABITAT GOAL

Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for migratory breeding birds, native fishes, and wintering ungulates.

WET MEADOW, GRASSLAND, AND SHRUB-STEPPE HABITAT GOAL

Provide structurally complex native meadow, grassland, and shrub-steppe habitats, within a watershed context, for upland-nesting migratory birds, sagebrush-dependent species, rare plant species, and other resident wildlife.

ASPEN FOREST, MIXED CONIFEROUS FOREST, AND WOODLAND HABITAT GOAL

Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrubland for cavity-nesting birds and other migratory and resident wildlife.

VISITOR SERVICES AND CULTURAL RESOURCES GOAL

Provide quality wildlife-dependent recreation, environmental education, interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley, for visitors and local community members of all abilities, while maintaining the primitive and remote experience unique to the refuge.

REFUGE OPERATIONS GOAL

Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

PLANNING PROCESS

In 2006, a planning team of refuge and other Service staff gathered to begin planning the future direction of Red Rock Lakes National Wildlife Refuge. The planning process included designing a vision for the refuge, along with goals to reach that vision. The team invited the state and various tribes to serve on the planning team. We received a commitment from Montana Fish, Wildlife and Parks to participate in the process. In June 2006, a notice of intent was

published in the *Federal Register* and planning updates were mailed inviting the public to participate in the planning process and public scoping meetings. A mailing list of about 250 names was created which included private citizens; local, regional, and state government representatives and legislators; other federal agencies; tribal governments; and nonprofit organizations. Key issues (habitat, wildlife, fisheries, visitor use, and refuge operations) were identified during analysis of the topics raised by refuge staff, partners, and the public. The unique qualities and values of the refuge were also identified. The team determined which of these qualities and issues were key to achieving the vision and goals. These were addressed throughout the planning process and in the comprehensive conservation plan. Four alternatives were developed for addressing substantive issues and managing refuge programs. The draft environmental assessment and comprehensive conservation plan was released to the public in September 2008. Two public meetings were held and the public was given 60 days to review the draft plan. In addition to the public meetings, over 100 additional comments were received. Through the environmental analysis process, including internal and public reviews, the Service has selected alternative B from the draft environmental assessment and comprehensive conservation plan. Substantive public comments were addressed in the final plan, resulting in modifications to the final document. Responses to public comments are summarized in appendix A. This alternative is now the final comprehensive conservation plan. Implementation of this plan will be monitored throughout its 15-year effective period.

ISSUES

Several key issues were identified during the planning process that affect the refuge such as habitat loss and fragmentation caused by residential development; inadequate monitoring of the current grazing program to determine its effectiveness as a management tool; the effect on the refuge of loss of wetlands throughout the United States; the scarcity of information on the ecology of montane (the zone below the subalpine zone) wetlands; providing suitable habitat for migratory birds, including trumpeter swans; maintaining one of the last known endemic populations of adfluvial Arctic grayling; management of fishing and hunting; management and improvements to trails, roads, and signage, while maintaining the wilderness characteristics of the refuge; the ecology of the Centennial Sandhills; stream restoration; invasive plant species; aquatic nuisance species; law enforcement; inadequate staffing; and fire management.

EXPECTED OUTCOMES OF THE PLAN

Based on the analysis document included in the environmental assessment in the draft comprehensive conservation plan, the Service's director for region 6 (Mountain-Prairie Region) approved alternative B for implementation. The key actions for this plan are summarized in the following section. A complete description of all objectives and strategies are found in chapter 4.

Management under alternative B acknowledges the importance of naturally functioning ecological communities on the refuge. However, changes to the landscape (for example, human alterations to the landscape, created wetlands, and species in peril requiring special management actions) prevent management of the refuge solely as a naturally functioning ecological community. Because some of these changes are significant, some refuge habitats will require "hands on" management actions during the life of this plan. Visitor services programs (such as hunting, fishing, wildlife observation and photography, environmental education, interpretation, and outreach programs) will be improved and expanded while maintaining the wilderness characteristics of the refuge.

HABITAT AND WILDLIFE MANAGEMENT

There will be improved management of wetland habitats for trumpeter swans and other waterfowl. Management will focus on maintaining high wetland productivity through infrequent drawdowns of modified and created wetlands to benefit breeding and migrating waterfowl. The management of riparian areas will be designed to benefit migratory bird species, and moose and Arctic grayling. A riparian habitat is the area along a natural watercourse, such as a river or stream. Some modified wetlands will be restored back to free-flowing streams and associated riparian corridors. Management actions (such as prescriptive grazing and prescribed fire) will only occur on the refuge to achieve specific habitat and wildlife objectives, with increased and improved oversight, monitoring, and research (when appropriate) conducted to assess if management objectives are being met. The refuge will continue to support the "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans" (Subcommittee on Rocky Mountain Population of Trumpeter Swans 2008).

VISITOR SERVICES

Management will emphasize improving and maintaining high-quality public opportunities for wildlife-dependent recreation for visitors of all abilities. Visitors will be better oriented to the refuge through accurate brochures and limited signage. Some of the criteria for all visitor services

programs is to ensure (1) all proposed public uses are compatible, (2) visitors know that they are visiting a national wildlife refuge, (3) visitors understand the specific regulations in place to provide for their safety and protection of the refuge resources and wildlife, and (4) any additional visitor facilities and signage compliment the refuge's wilderness setting. Additional environmental education and interpretation opportunities will be provided in order to better orient the public, while fostering support for refuge programs through a better understanding and awareness of the values of the refuge and Centennial Valley. Hunting programs will continue or be modified or expanded to provide quality hunting experiences while ensuring that trumpeter swans and other priority migratory birds are provided protected nesting and resting areas. An auto tour route along roads open to the public will be developed and interpreted through a brochure and minimal signage. A blind will be provided for photographers and hunters with disabilities.

FACILITIES AND STAFF

Refuge and visitor services facilities will continue to be maintained, including historical structures that are being used. Staff numbers and refuge housing have remained static since the 1950s. During this time, refuge visitor numbers have grown, programs and issues have become more complex, and there are greater opportunities to better understand and manage refuge resources. The refuge currently has five full-time staff members, including one biologist. To carry out this plan, additional staff will be required including a full-time wildlife biologist, range technician, temporary visitor services specialist, temporary office assistant, and permanent seasonal maintenance worker. At least three temporary biological science technicians will be recruited for the summer field season. One permanent refuge staff member will be required to maintain law enforcement credentials. Up to four residences will be needed to accommodate additional staff. These residences will complement existing refuge buildings. To accommodate additional volunteers, the refuge will construct up to three recreational vehicle concrete pads.

STEP-DOWN MANAGEMENT PLANS

The comprehensive conservation plan is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, visitor services, and partnership objectives over the next 15 years. When the plan is implemented, additional step-down management plans will be developed. The purpose of the step-down management plans is to provide greater detail to managers and employees for carrying out specific actions and strategies authorized by the comprehensive conservation plan. Table 9 (chapter 4) presents the plans needed for the refuge, their status, and the next revision date.

Abbreviations

ARM	adaptive resource management
Administration Act	National Wildlife Refuge System Administration Act
ATV	all-terrain vehicle
AUM	animal unit months
BP	before present
BLM	Bureau of Land Management
CCP	comprehensive conservation plan
CFR	Code of Federal Regulations
CO₂	carbon dioxide
compact	Water Rights Compact
°F	degrees Fahrenheit
districts	wetland management districts
DNRC	Montana Department of Natural Resources and Conservation
EA	environmental assessment
FMP	fire management plan
FONSI	finding of No Significant Impact
GS	general pay schedule
GYE	Greater Yellowstone Ecosystem
IBA	Important Bird Area
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IWJV	Intermountain West Joint Venture
MFWP	Montana Fish, Wildlife and Parks
msl	mean sea level
MTNHP	Montana Natural Heritage Program
NEPA	National Environmental Policy Act
NOI	notice of intent
PL	public law
PM	particulate matter
refuge	Red Rock Lakes National Wildlife Refuge
Refuge System	National Wildlife Refuge System
sandhills	Centennial Sandhills
SAV	submerged aquatic vegetation
Service	U.S. Fish and Wildlife Service
U.S.	United States
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCS	water control structure
WG	wage grade pay schedule
WMD	wetland management district
WPA	Works Progress (or Project) Administration
WUI	wildland-urban interface
YNP	Yellowstone National Park

Definitions of these and other terms are in the glossary, located after Chapter 4.

1 Introduction



Michele Hernandez/USFWS

Sunset over Upper Red Rock Lake.

The U. S. Fish and Wildlife Service (Service) has developed this final comprehensive conservation plan (CCP) to provide a foundation for the management and use of Red Rock Lakes National Wildlife Refuge (refuge). This refuge is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima (see figure 1). It is one of the most remote refuges in the contiguous United States. This CCP is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, visitor services, and partnership objectives over the next 15 years. When the plan is implemented additional step-down management plans will be developed. The purpose of these step-down management plans is to provide greater detail to managers and employees for carrying out specific actions and strategies authorized by the CCP. Table 9 (chapter 4) presents the plans needed for the refuge, their status, and the next revision date. This chapter provides an introduction to the CCP process and describes the involvement of the Service, the state of Montana, tribes, the public, and others, as well as conservation issues and plans that affect Red Rock Lakes National Wildlife Refuge.

This CCP was developed in compliance with the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) and Part 602 “National Wildlife Refuge System Planning” of “The Fish and Wildlife Service Manual.” The actions described in

this CCP meet the requirements of the Council on Environmental Quality regulations that implement the National Environmental Policy Act of 1969 (NEPA). Compliance with NEPA was also achieved through involvement of the public.

This final CCP specifies the necessary actions to achieve the vision and purposes of the refuge. Wildlife is the first priority in refuge management, and various public uses, including wildlife-dependent recreation may be allowed as long as they are determined to be compatible with the Service’s purposes for the refuge and the mission of the refuge.

This CCP has been prepared by a planning team comprised of refuge staff and representatives from various state and Service programs. In addition, the planning team used public input, public involvement, and the planning process as described in section 1.6, “Planning Process.” See appendix A for details about the public involvement process.

After reviewing a wide range of public comments and management needs, the planning team developed alternatives for managing the refuge. This was documented in the “Draft Comprehensive Conservation Plan and Environmental Assessment—Red Rock Lakes National Wildlife Refuge.” The regional director of region 6 approved alternative B as the Service’s preferred alternative for management of the refuge. This preferred alternative has now become this final CCP. This action addressed

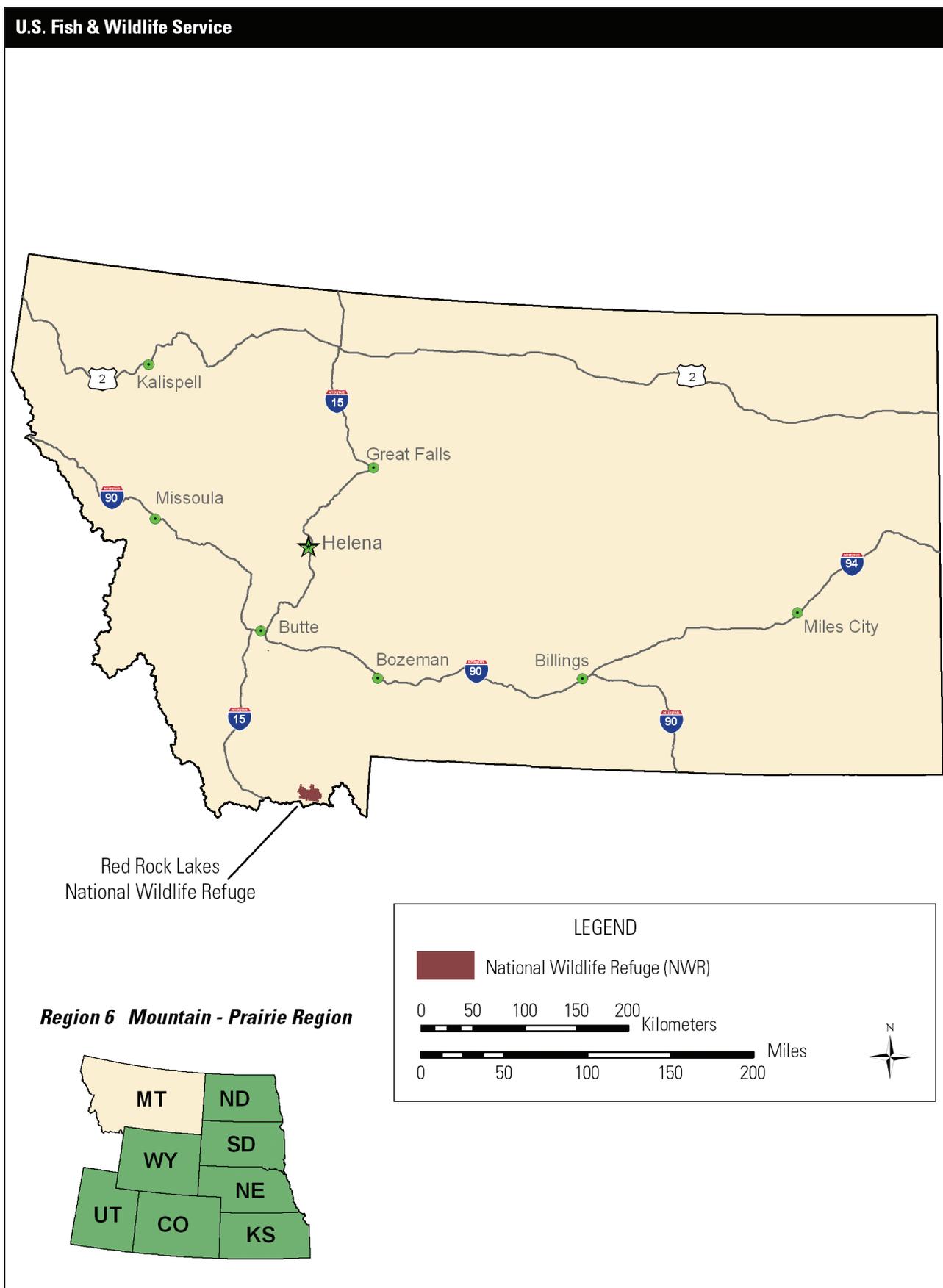


Figure 1. Location of Red Rock Lakes National Wildlife Refuge, Montana.

all substantive issues, while determining how best to achieve the purposes of the refuge.

1.1 PURPOSE AND NEED FOR THE PLAN

The purpose of this final CCP is to identify the role that Red Rock Lakes National Wildlife Refuge will play in support of the mission of the National Wildlife Refuge System (Refuge System) and to provide long-term guidance for managing refuge programs and activities. The CCP is needed to

- communicate with the public and other partners in efforts to carry out the mission of the Refuge System;
- provide a clear statement of direction for managing the refuge;
- provide neighbors, visitors, and government officials with an understanding of the Service's management actions on and around the refuge;
- ensure that the Service's management actions support the goals and intent of the Improvement Act;
- to the extent practicable, ensure refuge plans will be consistent with the fish and wildlife conservation plans of the state and the conservation programs of tribal, public, and private partners within the ecosystem;
- provide a basis for development of budget requests for the refuge's operation, maintenance, and capital improvement needs.

1.2 EARLY HISTORY OF CONSERVATION

Wildlife conservation in North America evolved to take on a form unique to the world. In recent years it has come to be known as the North American Model of Wildlife Conservation (Geist et al. 2001). The wildlife conservation movement arose out of the conflict between market hunters and sport hunters in the mid- to late-19th century. Market hunting increased in response to the growth in urban population fueled by the Industrial Revolution. Between 1820 and 1860 the percentage of Americans who lived in cities increased from 5% to 20%; this four-fold increase is the greatest proportional increase in urban population that ever occurred in America (Reiss 1995). The demand for meat and hides—along with feathers for the millinery trade—led to exploitation of game animals by market hunters. Along with the increase in the urban population came a new breed of hunter—one who hunted for the chase and the challenge it provided. These sport hunters valued game animals more when they were alive, as opposed to market hunters who placed value on dead animals they could bring to market. The growing legion of sport hunters fomented a national movement that resulted in state and federal governments taking responsibility for regulating the take of wildlife.

The keystone concept of the North American Model of Wildlife Conservation, and the bedrock that allowed government to exercise control, is the Public Trust Doctrine (Geist and Organ 2004). Originating in an 1842 Supreme Court decision in the *Martin v. Waddell* case, its origins derive from Greek and Roman law and the Magna Carta. Simply stated, wildlife belongs to no one; it is held in trust for all by government.

The seven pillars of the North American Model of Wildlife Conservation are:

- wildlife as a public trust resource
- elimination of markets for game
- allocation of wildlife by law
- wildlife can only be killed for a legitimate purpose
- wildlife considered an international resource
- science as the proper tool to discharge wildlife policy
- democracy of hunting

These pillars have stood the test of time and have seen significant changes in approaches to wildlife conservation for over 100 years. The original conservation movement championed by Theodore Roosevelt, George Bird Grinnell and others placed emphasis on stemming the decline, and programs restricting take and protecting lands were put in place. During the 1920s, conservationists realized that more was needed, and a committee comprised of Aldo Leopold, A. Willis Robertson, and other leading conservationists of the time authored the 1930 American Game Policy. This policy called for an active program of restoration of habitats and populations based on scientific research, and stable equitable funding to achieve this. Within a decade, landmark legislation fulfilled many of the needs identified, with passage of the Duck Stamp Act to fund land acquisition for national wildlife refuges, and the Pittman–Robertson Wildlife Restoration Act that shifted excise taxes imposed on firearms and ammunition to fund wildlife restoration through cooperation between the U.S. Fish and Wildlife Service and state fish and wildlife agencies. In order for states to avail themselves of these funds, they were required to pass laws that prevented revenues from hunting licenses to be diverted to any purpose other than administration of the state fish and wildlife agency.

In recent decades, the importance of overall wildlife diversity has gained more emphasis in wildlife management. All wildlife have benefited from the North American Model of Wildlife Conservation pillars, not just game animals. However, the vast majority of funding for wildlife conservation at the federal and state level comes from Pittman–Robertson excise taxes, Duck Stamp revenues, and hunting license sales. We owe the origins of the National Wildlife Refuge System to the hunters

who articulated the need and provided the funds (Grinnell 1913). The National Wildlife Refuge System has evolved along with the North American Model of Wildlife Conservation, and today provides refuge for virtually all species found in America, and recreation for all Americans. It is a realization of the North American Model of Wildlife Conservation to provide for science-based management of international wildlife resources held in trust for all. The importance of this system to our society can best be appreciated if we were to contemplate its loss. Wildlife connects us to the heritage of this country and our ancestors who built our society. It connects us as well to the natural world of which we are a part, but from which we have become so disconnected. To lose this connection is to lose the basis of our humanity.

1.3 U.S. FISH AND WILDLIFE SERVICE AND THE REFUGE SYSTEM

The U.S. Fish and Wildlife Service is the principal federal agency responsible for fish, wildlife, and plant conservation. The Refuge System is one of the Service's major programs.

U.S. FISH AND WILDLIFE SERVICE

The mission of the U.S. Fish and Wildlife Service, working with others, is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

In the late 19th and early 20th centuries, America's fish and wildlife resources were declining at an alarming rate, largely due to unrestricted market hunting. Concerned citizens, scientists, and hunting and angling groups joined together and generated the political will for the first significant conservation measures taken by the federal government. These actions included the establishment of the Bureau of Fisheries in the 1870s, and in 1904, passage of the first federal wildlife law, the Lacey Act, that prohibited interstate transportation of wildlife taken in violation of state laws. Beginning in 1903, President Theodore Roosevelt created over fifty wildlife refuges across the nation. Over the next 3 decades the United States ratified the Migratory Bird Treaty with Great Britain; and Congress passed laws to protect migratory birds, establish new refuges, and create a funding source for refuge land acquisition. In 1940, the U. S. Fish and Wildlife Service was created within the Department of the Interior, and existing federal wildlife functions including law enforcement, fish management, animal damage control, and wildlife refuge management were combined into a single organization for the first time.

Today, the Service enforces federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores vital wildlife habitat, protects and recovers endangered species, and helps other governments with conservation efforts. In addition, the Service administers a federal aid program that distributes hundreds of millions of dollars to states for fish and wildlife restoration, boating access, hunter education, and related programs across America.

SERVICE ACTIVITIES IN MONTANA (2006)

Service activities in Montana contribute to the state's economy, ecosystems, and education programs. The following list highlights the Service's presence and activities:

- employed 142 people in Montana
- 407 volunteers donated more than 21,131 hours to Service projects on refuge lands
- managed two national fish hatcheries, one fish and wildlife management assistance office, one fish health center, four ecological services offices, and one fish technology center
- managed twenty-three national wildlife refuges encompassing 1,195,828 acres (1.27% of the state)
- managed five wetland management districts (districts)
 - managed 47,884 acres of fee waterfowl production areas
 - managed 135,320 acres under various leases or easements
- hosted more than 629,950 annual visitors to Service-managed lands
 - 112,835 hunting visits
 - 71,665 fishing visits
 - 419,062 wildlife observation visits
 - 9,905 students (8,944 in on-site programs) participated in environmental education programs
- provided \$6.9 million to Montana Fish, Wildlife and Parks (MFWP) for sport fish restoration and \$6.3 million for wildlife restoration and hunter education (generated through taxing hunting and fishing equipment)
- since 1988, the Service's Partners for Fish and Wildlife Program has helped private landowners restore more than 27,402 wetland acres on 2,141 sites; 320,124 upland acres on 298 sites; and 1,138 miles of river habitat
- paid Montana counties \$315,271 under the Refuge Revenue Sharing Act (money used for any public purpose)

NATIONAL WILDLIFE REFUGE SYSTEM

In 1903 President Theodore Roosevelt designated the 5.5-acre Pelican Island in Florida as the nation's first wildlife refuge for the protection of native nesting birds. This was the first time the federal government set aside land for wildlife. This small but significant designation was the beginning of the Refuge System.

One hundred years later, the Refuge System has become the largest collection of lands and waters in the world specifically managed for wildlife, encompassing over 150 million acres within 550 refuges and over 3,000 waterfowl production areas for waterfowl breeding and nesting. Today, there is at least one refuge in every state and in each of the Pacific and Caribbean territories.

The Improvement Act of 1997 established a clear mission for the Refuge System.

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Improvement Act states that each national wildlife refuge (that is, each unit of the Refuge System, which includes wetland management districts) shall be managed to

- fulfill the mission of the Refuge System;
- fulfill the individual purposes of each refuge and district;
- consider the needs of fish and wildlife first;
- fulfill the requirement of developing a CCP for each unit of the Refuge System and fully involve the public in preparation of these plans;
- maintain the biological integrity, diversity, and environmental health of the Refuge System;
- recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses;
- retain the authority of refuge managers to determine compatible public uses.

In addition to the mission for the Refuge System, the wildlife and habitat vision for each unit of the Refuge System maintains the following principles:

- Wildlife comes first.
- Ecosystems, biodiversity, and wilderness are vital concepts in refuge and district management.

- Habitats must be healthy.
- Growth of refuges and districts must be strategic.
- The Refuge System serves as a model for habitat management with broad participation from others.

Following passage of the Improvement Act, the U.S. Fish and Wildlife Service immediately began to carry out the direction of the new legislation, including preparation of CCPs for all national wildlife refuges and wetland management districts. Consistent with the Improvement Act, the Service prepares all CCPs in conjunction with public involvement. Each refuge and each district is required to complete its CCP within the 15-year schedule (by 2012).

PEOPLE AND THE REFUGE SYSTEM

The nation's fish and wildlife heritage contributes to the quality of American lives and is an integral part of the country's greatness. Wildlife and wild places have always given people special opportunities to have fun, relax, and appreciate the natural world.

Whether through bird watching, fishing, hunting, photography, or other wildlife pursuits, wildlife recreation contributes millions of dollars to local economies. In particular, money generated from the taxing of sporting arms and ammunition, and of fishing equipment, authorized by the Pittman–Robertson and Dingell–Johnson Acts, respectively, have generated tens of millions of dollars. This money, distributed by the U.S. Fish and Wildlife Service, has been used by states to increase wildlife and fish populations, expand habitat, and train hunters across the nation. Approximately 37 million people visited the Refuge System in 2004, mostly to observe wildlife in their natural habitats. Visitors are most often accommodated through nature trails, auto tours, interpretive programs, and hunting and fishing opportunities. Significant economic benefits are being generated to the local communities that surround refuges and wetland management districts. Economists report that Refuge System visitors contribute more than \$1.4 billion annually to local economies.

1.4 NATIONAL AND REGIONAL MANDATES

Refuge System units are managed to achieve the mission and goals of the National Wildlife Refuge System, along with the designated purpose of each refuge and district (as described in establishing legislation, executive orders, or other establishing documents). The key concepts and guidance of the Refuge System are contained in the Refuge System Administration Act of 1966 (Administration Act), Title 50 of the Code of Federal Regulations (CFR), “The Fish and Wildlife Service Manual,” and the Improvement Act.

The Improvement Act amends the Administration Act by providing a unifying mission for the Refuge System, a new process for determining compatible public uses on refuges and districts, and a requirement that each refuge and district be managed under a CCP. The Improvement Act states that wildlife conservation is the priority of Refuge System lands and that the Secretary of the Interior will ensure that the biological integrity, diversity, and environmental health of refuge lands are maintained. Each refuge and district must be managed to fulfill the Refuge System's mission and the specific purposes for which it was established. The Improvement Act requires the Service to monitor the status and population of fish, wildlife, and plants in each refuge and district.

A detailed description of these and other laws and executive orders that may affect the CCP or the Service's implementation of the CCP is found in appendix B. Service policies on planning and day-to-day management of refuges and districts are in the "Refuge System Manual" and "The Fish and Wildlife Service Manual."

1.5 REFUGE CONTRIBUTIONS TO NATIONAL AND REGIONAL PLANS

Red Rock Lakes National Wildlife Refuge contributes to the conservation efforts outlined in the various state and national plans described here.

FULLFILLING THE PROMISE

A 1999 report, "Fulfilling the Promise, The National Wildlife Refuge System" (USFWS 1999b), is the culmination of a yearlong process by teams of Service employees to evaluate the Refuge System nationwide. This report was the focus of the first national Refuge System conference (in 1998)—attended by refuge managers, other Service employees, and representatives from leading conservation organizations.

The report contains forty-two recommendations packaged with three vision statements dealing with wildlife and habitat, people, and leadership. This CCP deals with all three of these major topics. The planning team reviewed the recommendations in the document for guidance during CCP planning.

PACIFIC FLYWAY MANAGEMENT PLAN FOR THE ROCKY MOUNTAIN POPULATION OF TRUMPETER SWANS

The "Pacific Flyway Plan for the Rocky Mountain Population of Trumpeter Swans" (Subcommittee on Rocky Mountain Population of Trumpeter Swans 2008) provides broad direction to the states, the U.S. Fish and Wildlife Service, and other interests engaged in cooperative management of this

population. The document was developed by The Pacific Flyway Council's Subcommittee on Rocky Mountain Population of Trumpeter Swans. The plan has been periodically updated to address evolving management challenges and to incorporate new information. The Pacific Flyway Council approved the most recent revision in 2008. The 2008 plan included six objectives to (1) redistribute wintering swans, (2) rebuild the United States breeding flocks, (3) encourage the growth of Canadian flocks, (4) increase the abundance of desirable submersed macrophytes in Henry's Fork of the Snake River, (5) monitor the population, and (6) maintain the tundra swan hunt in the Pacific Flyway in a manner compatible with trumpeter swan restoration. The plan assigns specific tasks and time frames to carry out the strategies listed. Population objectives specific to the Centennial Valley, including the refuge, are provided in this CCP as part of the objective to rebuild the United States' breeding flocks. In the past the refuge has used, and will continue to use, the "Pacific Flyway Plan for the Rocky Mountain Population of Trumpeter Swans" to determine refuge management objectives for trumpeter swans.

PARTNERS IN FLIGHT

The Partners in Flight program began in 1990 with the recognition of declining populations of many migratory bird species (Rich et al. 2004). The challenge is, according to the program, maintaining functional natural ecosystems in the face of human population growth. To meet this challenge, Partners in Flight worked to identify priority land bird species and habitat types. Partners in Flight activity has resulted in fifty-two bird conservation plans covering the contiguous United States.

The primary goal of Partners in Flight is to provide for the long-term health of bird life on this continent. The first priority is to prevent the rarest species from going extinct. The second priority is to prevent uncommon species from descending into threatened status. The third priority is to "keep common birds common."

There are fifty-eight physiographic areas, defined by similar physical geographic features, wholly or partially contained within the continental United States, and several others wholly or partially in Alaska. Red Rock Lakes National Wildlife Refuge lies within the physiographic area known as the central Rocky Mountains (see figure 2). It is a huge physiographic area, extending from northwest Wyoming to all of western Montana, the northern two-thirds of Idaho, large areas of eastern Oregon and Washington, much of southeast British Columbia, and a sliver of west Alberta. It is an area of high mountains, with elevations exceeding 10,000 feet. Glaciation has left broad flat valleys between mountain ranges. Elevation determines the dominant vegetation. The highest areas are alpine tundra. The

subalpine zone is dominated by Engelmann spruce and subalpine fir, with ponderosa pine and Douglas-fir in the montane zone below that. Stand-replacing fire can change forests in either of those zones to lodgepole pine or aspen. Grass and sagebrush occur under open pine forests that grade downslope into grasslands, wetlands, woodlands, or shrub-steppe.

Approximately twenty-eight species of birds have a higher population in the central Rocky Mountains than in any other physiographic area. This is the highest such number in any physiographic area in the contiguous United States, and it seems to represent the huge size of the area and the vast amount of quality bird habitat that still exists.

Fire in higher elevation coniferous forests of the central Rocky Mountains tends to be of high intensity and low frequency. After such stand-replacing fires, either aspen or lodgepole pine occupy a site until a century or more of succession results in redominance of the site-specific hemlock, spruce, or fir species. Many birds are dependent on these different stages of succession—both black-backed and three-toed woodpeckers specialize in foraging on charred postfire trees. Dusky grouse and Williamson's sapsucker are among those species most abundant in aspen.

A huge percentage of the central Rockies in the United States are in public ownership, mostly managed by the Forest Service. Maintenance

or restoration of healthy forest ecosystems on public and private industrial lands will be the most important factor in keeping the central Rocky Mountains a healthy ecosystem for so many forest birds.

The priority bird species and habitats of the central Rocky Mountains found on the refuge include the following:

Shrub-steppe

greater sage-grouse

Wetland

American white pelican

trumpeter swan

Barrow's goldeneye

Franklin's gull

Riparian

calliope hummingbird

Coniferous forest

Dusky grouse

black-backed woodpecker

Aspen

Williamson's sapsucker

red-naped sapsucker

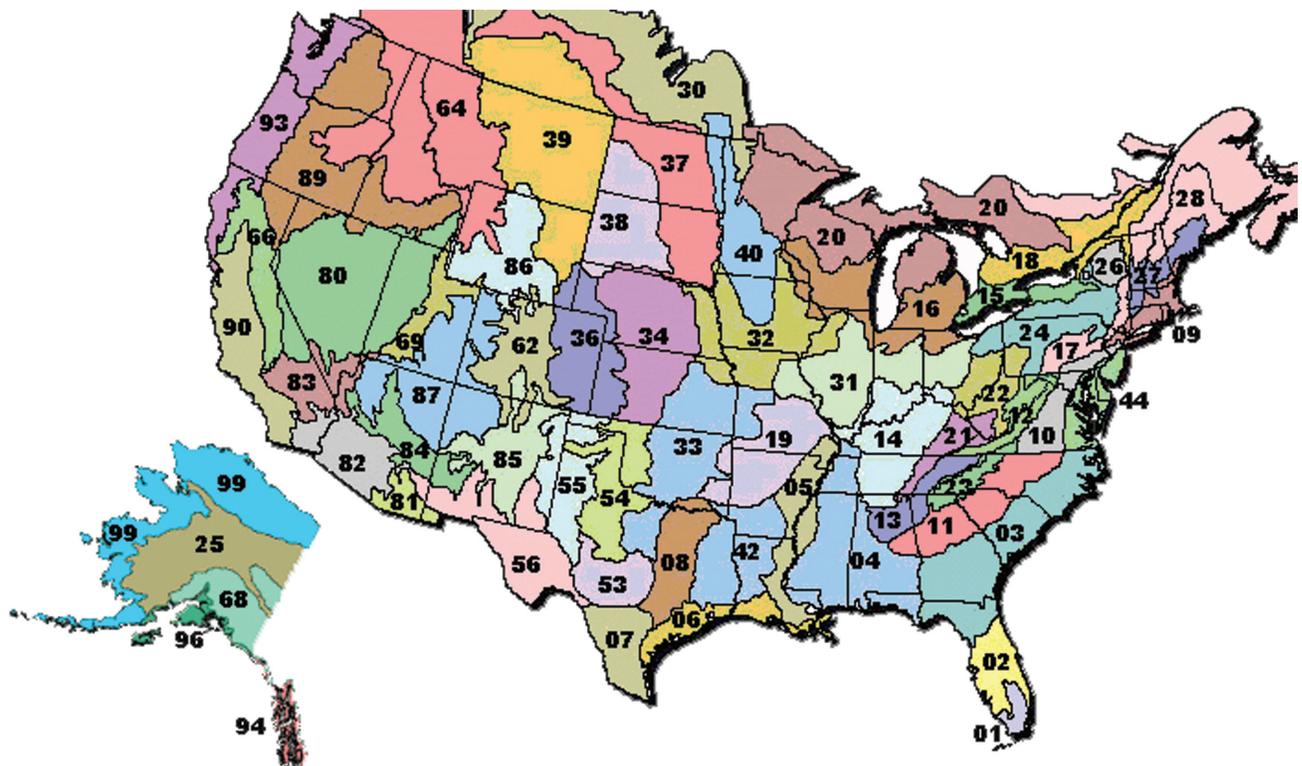


Figure 2. Physiographic area map of the United States. Red Rock Lakes National Wildlife Refuge lies within physiographic region 64.

(Source: *Partners in Flight*)

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

Originally written in 1985, the “North American Waterfowl Management Plan” (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986) envisioned a 15-year effort to achieve landscape conditions that could sustain waterfowl populations. Specific plan objectives are to increase and restore duck populations to the average levels of the 1970s—62 million breeding ducks and a fall flight of 100 million birds.

By 1985 waterfowl populations had plummeted to record lows. Habitat that waterfowl depend on was disappearing at a rate of 60 acres per hour. Recognizing the importance of waterfowl and wetlands to North Americans and the need for international cooperation to help in the recovery of a shared resource, the United States and Canadian governments developed a strategy to restore waterfowl populations through habitat protection, restoration, and enhancement. Mexico became a signatory to the plan in 1994.

The plan is innovative because of its international scope and its implementation at the regional level. Its success depends on the strength of partnerships called “joint ventures,” involving federal, state, provincial, tribal, and local governments; businesses; conservation organizations; and individual citizens.

Joint ventures are regional self-directed partnerships that carry out science-based conservation through a wide array of community participation. Joint ventures develop implementation plans that focus on areas of concern identified in the plan. Red Rock Lakes National Wildlife Refuge lies within the Intermountain West Joint Venture.

INTERMOUNTAIN WEST JOINT VENTURE

The Intermountain West Joint Venture (IWJV) was established in June of 1994 to serve as the implementation arm of the “North American Waterfowl Management Plan” (Intermountain West Joint Venture 2005b) in the Intermountain West region. The focus of the IWJV was conservation of wetland and associated habitats. The IWJV is comprised of multi-level partnerships between diverse public and private organizations who share common interest in the conservation, maintenance, and management of key ecosystems in the Intermountain West region.

The IWJV encompasses much of the Intermountain West region, from the Sierras and Cascades on the west to just east of the Rocky Mountains, and from the Mexican border on the south to the Canadian border on the north. This extensive geographic region encompasses portions of eleven western states and includes an enormous diversity of avian habitat.

In 2005 the IWJV Montana steering committee developed a “Coordinated Implementation Plan for Bird Conservation in Western Montana” (Intermountain West Joint Venture 2005a). This team divided the state of Montana into Bird Habitat Conservation Areas to be used for all bird conservation projects over the next 5 to 7 years. Red Rock Lakes National Wildlife Refuge is located in the Centennial/Beaverhead Bird Habitat Conservation Area and has almost all of the habitat types and species identified as priorities for this region. The plan identifies this refuge as the single most important nesting area for trumpeter swans within the Intermountain West region.

The refuge will continue to work closely with the IWJV to support ongoing planning efforts and meet their objectives, by protecting high priority habitats and the species they support.

INTERMOUNTAIN WEST REGIONAL SHOREBIRD PLAN

The “Intermountain West Regional Shorebird Plan” (Oring et al. 2000) was released in 2000. The plan notes that perhaps one million shorebirds breed in the Intermountain West region and that millions more migrate through the area each year. The plan recognizes that finding ample high-quality fresh water will be the greatest challenge faced by shorebirds in the Intermountain West region. The shorebird plan articulates seven goals plus associated objectives and strategies related to habitat management, monitoring and assessment, research, outreach, and planning. The planning goal includes objectives to coordinate shorebird planning and projects with other migratory bird initiatives and specifically with the Intermountain West Joint Venture. The shorebird plan identifies eleven species of shorebirds that regularly breed in the region, as well as twenty-three additional species that are annual migrants. Red Rock Lakes National Wildlife Refuge is recognized in the plan as one of the seventy-nine managed shorebird sites.

NORTH AMERICAN WATERBIRD CONSERVATION PLAN

The “North American Waterbird Conservation Plan” provides a contiguous framework for conserving and managing colonial nesting waterbirds, including 209 species of seabirds, coastal waterbirds (gulls, terns, pelicans), wading birds (herons, ibises), and marsh birds, such as certain grebes and bitterns. The overall goal of the plan is to ensure that the distribution, diversity and abundance of populations, habitats (breeding, migratory, and nonbreeding), and important sites of waterbirds are sustained or restored throughout their ranges in North America. The geographic scope of the plan covers twenty-eight countries, from Canada to Panama, as well as

islands and nearshore areas of the Atlantic, Pacific, Gulf of Mexico, and Caribbean Sea. As with the Intermountain West Joint Venture and Partners in Flight, this waterbird partnership includes federal, state, and provincial wildlife agencies, individuals, and nonprofit conservation organizations. Also, as with Partners in Flight and other migratory bird plans, the “North American Waterbird Conservation Plan” includes a goal to establish conservation action, and exchange information and expertise with other bird conservation initiatives. The plan also calls for establishment of Practical Units for Planning for terrestrial habitats; Western Montana, including Red Rock Lakes National Wildlife Refuge, falls within the Intermountain West Region Practical Units for Planning.

RECOVERY PLANS FOR FEDERALLY LISTED THREATENED OR ENDANGERED SPECIES

When federally listed threatened or endangered species occur at Red Rock Lakes National Wildlife Refuge, management goals and strategies in their respective recovery plans will be followed. Currently no threatened or endangered species reside on the refuge; nevertheless, this may change as species are listed, or as listed species are discovered on refuge lands. The refuge may have incidental visits by various listed species. To ensure the impacts to any of these species were considered in this document, the Service conducted a biological evaluation of the actions in this CCP per section 7 of the Endangered Species Act (see appendix C).

STATE COMPREHENSIVE FISH AND WILDLIFE CONSERVATION STRATEGY

“The Montana Comprehensive Fish and Wildlife Conservation Strategy” (MFWP 2005) covers all vertebrate species known to exist in Montana, including both game and nongame species, as well as some invertebrate species, such as freshwater mussels and crayfish. From the early years of fish and wildlife management, the focus has been placed on game animals and their related habitats because most of the agency’s funding has been provided by hunters and anglers.

Montana Fish, Wildlife and Parks does not intend to reduce its focus on important game species and maintains that conserving particular types of habitats will benefit a variety of game and nongame species. With this new funding mechanism and conservation strategy in place, MFWP believes that managing fish and wildlife more comprehensively is a natural progression in the effective conservation of Montana’s remarkable fish and wildlife resources (MFWP 2005). Although game species are included in MFWP’s conservation strategy, the priority is species and their related habitats “in greatest conservation need.” This means focus areas,

community types, and species that are significantly degraded or declining, are federally listed, or where important distribution and occurrence information used to assess the status of individuals and groups of species are lacking. Because management of game species has been largely successful over the last 100 years, most game species have populations that are stable or increasing, and fewer are identified as “in greatest conservation need” (forty-nine nongame, eleven game). MFWP’s conservation strategy uses five ecotypes to describe the broad areas of Montana’s landscape that have similar characteristics. Red Rock Lakes National Wildlife Refuge is located in the intermountain/foothill grassland ecotype, a mosaic of private and public land that extends from the glaciated Flathead River Valley to the north, south to Centennial Valley, and east to Little Belt Foothills. This western Montana ecotype harbors more wildlife communities than any other in Montana.

Within each of the ecotypes, Tier 1 (greatest need of conservation) geographic focus areas were identified for all terrestrial and aquatic areas of the state. Red Rock Lakes National Wildlife Refuge is located within the Southwest Montana Intermontane Basin and Valley focus area. The Tier 1 priority species for this area include the western toad, common loon, trumpeter swan, bald eagle, greater sage-grouse, long-billed curlew, flammulated owl, Townsend’s big-eared bat, pygmy rabbit, great basin pocket mouse, gray wolf, grizzly bear, and Canada lynx.

The “Montana Comprehensive Fish and Wildlife Conservation Strategy” outlines five conservation concerns and strategies for the Southwest Montana Intermontane Basin and Valley Focus Area. The key concerns are:

- habitat fragmentation and loss of connectivity as a result of human population growth and development
- invasive or exotic plant species
- altered fire system
- range or forest management practices
- streamside residential development

FISHERIES PROGRAM, VISION FOR THE FUTURE

The Fisheries Program of the U.S. Fish and Wildlife Service has played a vital role in conserving and managing fish and other aquatic resources since 1871. Today, the Fisheries Program is a critical partner with states, tribes, other governments, other Service programs, private organizations, public institutions, and interested citizens in a larger effort to conserve these important resources. The nation’s fish and other aquatic resources are among the richest and most diverse in the world. These resources have helped support the nation’s growth by providing enormous ecological, social, and economic benefits. Despite efforts by the Service and others

to conserve aquatic resources, a growing number are declining at alarming rates. Loss of habitat and invasive species are the two most significant threats to the diversity of aquatic systems. One-third of the nation's freshwater fish species are threatened or endangered, 72% of freshwater mussels are imperiled, and the number of threatened and endangered species has tripled in the last 20 years. Clearly, there is increasing urgency to identify and carry out actions that will reverse these alarming trends before it is too late (USFWS 2002a).

In order to better conserve and manage fish and other aquatic resources in the face of increasing threats, the Service worked with partners to refocus its Fisheries Program and develop a vision outlined in the document, "Fisheries Program, Vision for the Future" (USFWS 2002a). The vision of the Service and its Fisheries Program is working with partners to restore and maintain fish and other aquatic resources at self-sustaining levels and to support federal mitigation programs for the benefit of the American public. To achieve this vision, the Fisheries Program will work with its partners to

- *protect* the health of aquatic habitats,
- *restore* fish and other aquatic resources,
- *provide* opportunities to *enjoy* the benefits of healthy aquatic resources.

One of the objectives in this document states:

Objective 2.2: Restore declining fish and other aquatic resource populations before they require listing under the Endangered Species Act. The Fisheries Program will increase its support and assistance in stopping and reversing declines of native fish and other aquatic resources, including restoring fish passage and rebuilding populations.

Red Rock Lakes National Wildlife Refuge has one of the only endemic adfluvial populations of Arctic grayling in the contiguous United States, along with a native population of Westslope cutthroat trout. An endemic population is native to the region and its distribution is relatively limited to a particular locality. This population of Arctic grayling are lake-dwelling for most of the year, but use rivers and streams to spawn. Both of these populations are imperiled due to a significant loss of habitat, disease, and impacts from other nonnative fish species. In order to achieve this objective of restoring declining fish populations, the refuge will need to take management actions to enhance these species and their habitats, while ensuring that the purposes of the refuge are being met.

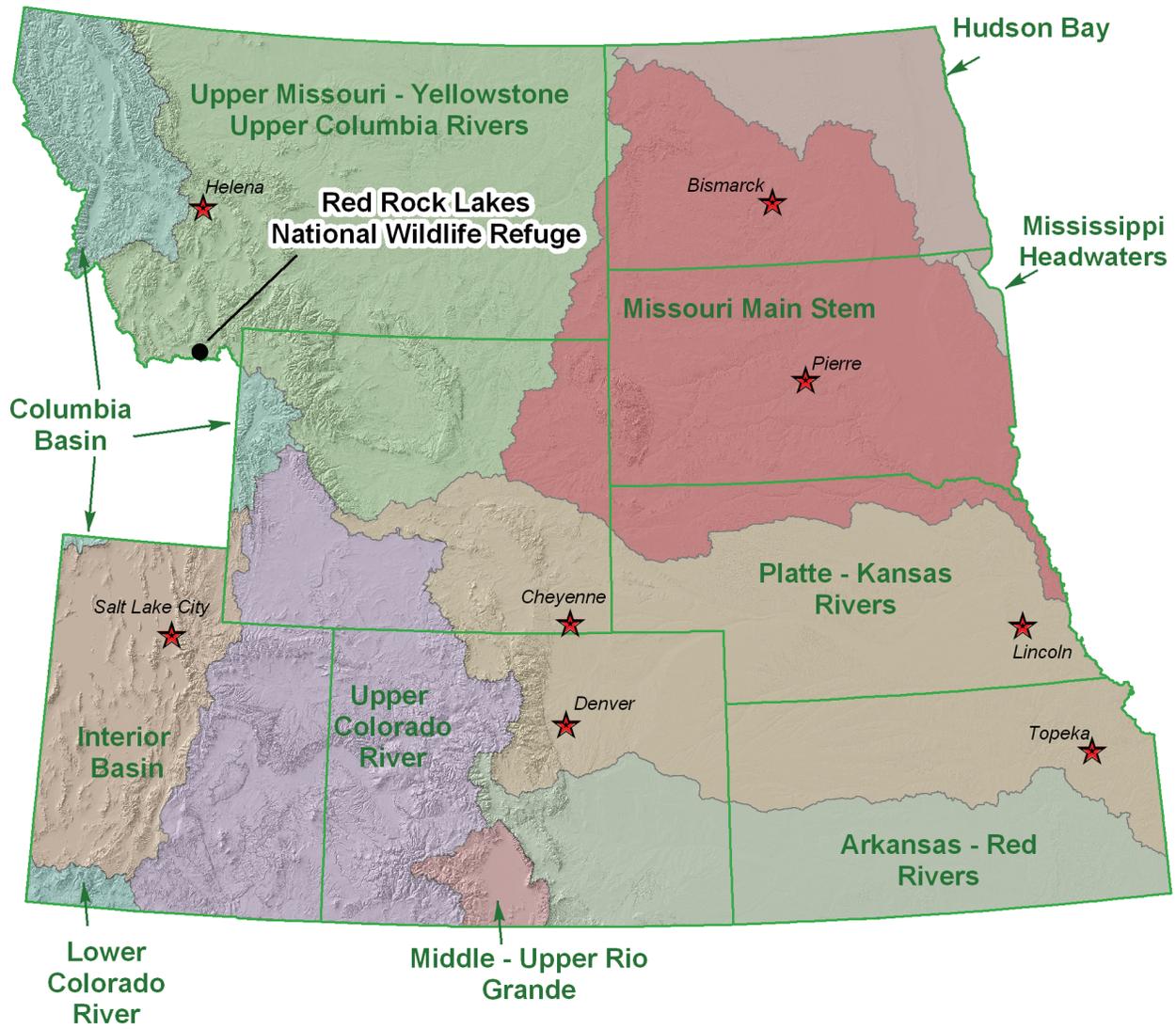
1.6 ECOSYSTEM DESCRIPTIONS AND THREATS

Red Rock Lakes National Wildlife Refuge is located within the Upper Missouri, Yellowstone, and Upper Columbia Rivers Ecosystem. This ecosystem lies within the Rocky Mountain and Great Plains physiographic provinces and includes a large part of Montana, northern Wyoming, and a small section of western North Dakota (see figure 3). Some of the wildest and most unpopulated country in the contiguous United States occurs within this 185,000 square mile area, including such significant protected areas as Yellowstone and Glacier National Parks, Charles M. Russell National Wildlife Refuge, Bob Marshall Wilderness, and the Upper Missouri River Breaks National Monument. Wildlife in these areas is abundant and diverse.

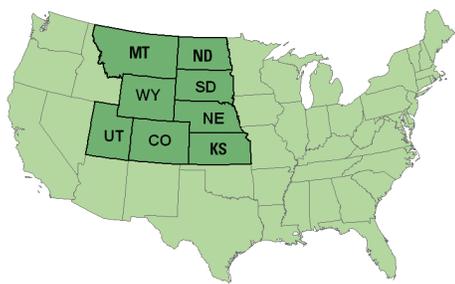
Threatened and endangered species are actively protected and managed within various areas of this ecosystem; those species include grizzly bear, gray wolf, black-footed ferret, bull trout, pallid sturgeon, piping plover, least tern, and water howellia. Some of these species, such as the grizzly bear and gray wolf, are only listed in certain areas. Both the gray wolf and grizzly bear have been observed on the refuge. Sitting astride the Continental Divide, the ecosystem gives rise to the Columbia and Missouri rivers. Three main habitat groups are predominant throughout the ecosystem: (1) mountain habitat, (2) river habitat, and (3) prairie habitat. Mountain habitat groups contain a number of habitat types. Arid lands in the valleys have mixed wheatgrass and fescue grasslands along with considerable acreage of sagebrush stands. Surrounding mountains are of moderate elevation and are cloaked with conifer forests. The highest elevations have Douglas-fir or spruce-fir forests or alpine vegetation. Gray wolves, grizzly bears, wolverines, and various species of trout occur in these habitat groups. River habitat groups are comprised of a mix of native prairie grass and sagebrush-steppe. Cottonwood- and shrub-dominated communities are also common. Many of the same animals that are present in the mountain habitat are present in the river habitat. Prairie habitat groups include woodlands and grass- or sage-dominated areas where adequate moisture for a forest canopy is not available. Higher elevations host subalpine communities and rock outcrops. Prairie grasslands or shrub-steppe dominate at lower elevations, with riparian areas along watercourses. Black-tailed prairie dogs, bald eagles, ferruginous hawks, and a diverse group of fish can be found in this habitat.

Key threats to the ecosystem include invasive plant species, conversion of native prairie to agriculture, and habitat fragmentation from development and population growth. Priorities for the Upper Missouri, Yellowstone, and Upper Columbia Rivers Ecosystem

U.S. Fish & Wildlife Service



Region 6 Mountain - Prairie Region



Red Rock Lakes National Wildlife Refuge

"Upper Missouri - Yellowstone Upper Columbia Rivers" U.S. Fish & Wildlife Service Ecosystem

0 50 100 200 300 400 Kilometers
 0 100 200 300 400 Miles

Figure 3. Upper Missouri, Yellowstone, and Upper Columbia rivers ecosystem map.

include ensuring natural and healthy ecological processes for the area, and making sure that economic development complements environmental protection.

THE GREATER YELLOWSTONE ECOSYSTEM

Red Rock Lakes National Wildlife Refuge is also part of an area designated as the Greater Yellowstone Ecosystem (GYE), an area roughly the size of West Virginia which straddles the states of Montana, Wyoming, and Idaho.

Within the GYE, the headwaters of three major river systems—the Yellowstone, the Snake, and the Green—support a renowned trout fishery and are the lifeblood of agriculture, towns, and cities.

The 18 million acre GYE is one of the largest, relatively intact temperate zone ecosystems left on earth. This area includes Yellowstone and Grand Teton national parks, portions of seven surrounding national forests, Bureau of Land Management lands, three national wildlife refuges, and state and private lands. Vast, roadless landscapes continue to be the hallmark of the GYE, the source of its attraction as well as its ecological health. They include designated wilderness areas within the region's seven national forests, Red Rock Lakes National Wilderness, undeveloped portions of two national parks, and also the surrounding lands managed by a number of federal and state agencies which have, as yet, neither roads nor legal restrictions on road-building.

In the GYE's natural tapestry, wildlife is a spectacular element, attracting worldwide interest and awe. The ecosystem is home to one of the largest herds of elk in North America, and is one of the few remaining areas in the contiguous United States where the magnificent grizzly bear still roams in significant numbers. The GYE serves as breeding and wintering ground for trumpeter swans, and is home to the largest free-ranging herd of bison in the contiguous United States. The GYE's relatively intact natural landscape appears to retain its full complement of vertebrate wildlife. Mountain lion and wolverine still roam its mountains, bighorn sheep scramble among its cliffs, moose browse its willows, and eagles grace the open sky (Greater Yellowstone Coalition 2006).

Residential development is the greatest threat to this ecosystem—threatening

ranching, destroying wildlife habitat, disrupting wildlife migrations, and compromising natural processes such as fire.

1.7 PLANNING PROCESS

This final CCP for the refuge follows the Improvement Act and NEPA, and the implementing regulations of both acts. The U.S. Fish and Wildlife Service issued its Refuge System planning policy in 2000. This policy established requirements and guidance for refuge and district plans—including CCPs and step-down management plans—to ensure that planning efforts follow the Improvement Act. The planning policy identified several steps of the CCP and environmental analysis process (see figure 4), which begins with preplanning.

Table 1 lists the specific steps in the planning process for the preparation of this final CCP. The Service began the pre-planning process in August 2005 with the establishment of a planning team. The planning team is comprised primarily of Service personnel from the refuge and representatives from Montana Fish, Wildlife and Parks. Some additional contributors included other Service divisions, U.S. Geological Service, Montana State University, and Bureau of Land Management (BLM) (see appendix D). During pre-planning, the team developed a mailing list, internal issues, and a special qualities list. Over the course of pre-planning and public scoping, the planning team collected available information about the resources of the refuge and the surrounding areas. This information was first summarized in chapter 4 of the draft environmental assessment (EA). This information has been retained in this final CCP in chapter 3. During preplanning, the refuge hosted three separate biological workshops inviting eighteen individuals from various

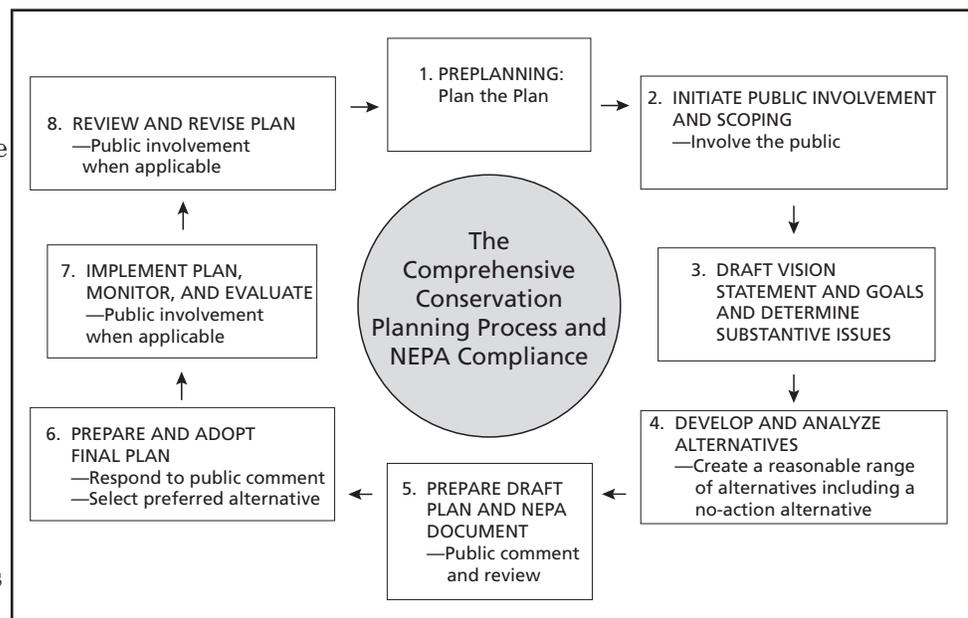


Figure 4. CCP and environmental analysis process steps.

Table 1. Planning process summary for Red Rock Lakes National Wildlife Refuge.

<i>Date</i>	<i>Event</i>	<i>Outcome</i>
August 16, 2005	Kickoff meeting	CCP overview developed, planning team list developed, purposes identified, initial issues and qualities list developed, development of mailing list started.
September 20, 2005	Visitor services review	Visitor services programs and facilities evaluated by education and visitor services staff.
February 21, 2006	Biological review	Gathered information from a team of researchers and biologists on the natural processes that formed and continue to influence Red Rock Lakes National Wildlife Refuge.
May 17, 2006	Biological review	Worked with contracted U.S. Geological Survey researcher to evaluate current biological programs and needs.
June 12, 2006	Notice of intent	Published notice of intent in <i>Federal Register</i> to start public scoping.
August 1, 2006	Planning update	First planning update sent to mailing list describing planning process and announcing upcoming public scoping meetings.
August 15, 2006	Public scoping meeting, Ennis, MT	Offered public opportunity to learn about the CCP and provide comments.
August 15, 2006	Vision and goals workshop	Developed draft vision and goals statements.
August 16, 2006	Public scoping meeting, Dillon, MT	Offered public opportunity to learn about the CCP and provide comments.
September 9, 2006	Public scoping meeting, Lima, MT	Offered public opportunity to learn about the CCP and provide comments.
September 11, 2006	Biological review	Panel of biologists and researchers gathered to review and evaluate biological program and issues.
January 5, 2007	Focus group meeting (realty issues)	Staff and realty specialists discussed boundary and conservation easement program issues.
January 10, 2007	Alternatives netmeeting workshop	Developed draft alternatives table.
February 12, 2007	Objectives and strategies workshop	Finalized alternatives table, selected proposed action, and began writing objectives/strategies.
April 2007	Draft CCP	Began writing draft CCP/EA.
July 11–25, 2008	Internal review of draft CCP	Draft CCP is reviewed by Service, state, and other federal partners.
September 26, 2008	NOA of public draft CCP	Notified the public that the CCP/EA was available for a 30-day review.
October 8, 2008	Public meeting in Lima, Montana	Offered public opportunity to learn about the draft CCP and provide comments.
October 9, 2008	Public meeting in Dillon, Montana	Offered public opportunity to learn about the draft CCP and provide comments.

Table 1. Planning process summary for Red Rock Lakes National Wildlife Refuge.

<i>Date</i>	<i>Event</i>	<i>Outcome</i>
October 20, 2008	Extended comment period	Provided the public an additional 30 days in which to comment on the draft CCP.
November 26, 2008	Comment period ends	Public comments must be emailed or postmarked by this date.
January 8–9, 2009	Planning team meeting	Based on substantive public and internal review comments, discussed needed revisions.
February 3, 2009	Meeting with refuge supervisor	Discussed public comments.
March 2009	Final CCP prepared	Prepared final CCP and made necessary revisions based on substantive public comments.
June 15, 2009	FONSI signed	Regional Director approved alternative B as the proposed action and signed the Finding of No Significant Impact.
December 2009	Final CCP completed	Finished editing final CCP for printing.

state and federal agencies who are experts in their fields. These groups discussed the challenges and opportunities identified by the refuge staff and the public and shared their expertise on options for managing the refuge in the future. A visitor services review was also conducted.

In compliance with the Federal Advisory Committee Act, the general public is consulted through the scoping process, including public meetings and solicitation of comments. This provides opportunities for the public to share concerns and issues they would like addressed, while providing their ideas on how to best manage the refuge.

COORDINATION WITH THE PUBLIC

A notice of intent (NOI) to prepare the draft CCP and EA was published in the *Federal Register* on June 12, 2006. A mailing list of more than 250 names including private citizens; local, regional, and state government representatives and legislators; other federal agencies; and interested organizations was prepared during pre-planning (see appendix A).

The first planning update issue was sent in July 2006 to everyone on the mailing list. Information was provided on the history of the refuge and the CCP process, along with an invitation to the public scoping meetings. Public scoping meetings were also announced through state and local media. Each planning update included a comment form to give the public an opportunity to provide written comments. Emails were also accepted at the refuge's email address: redrocks@fws.gov.

Three public scoping meetings were held within 2 hours distance of the refuge office. There were thirty-three attendees, primarily local citizens,

including surrounding ranchers. Following a presentation about the refuge and an overview of the CCP and NEPA processes, attendees were encouraged to ask questions and offer comments. Verbal comments were recorded, and each attendee was given a comment form to submit additional thoughts or questions in writing.

All written comments had to be postmarked by September 15, 2006. A total of fifty-five additional written comments were received throughout the scoping process. All substantive comments were shared with the planning team and considered throughout the planning process.

The draft CCP and EA was released to the public on September 26, 2008 through a notice of availability published in the *Federal Register*. Copies of either the draft CCP and EA and/or a planning update were mailed to individuals on the planning mailing list. Initially the public was offered a 30-day review period. Numerous requests from the public and state representatives resulted in an additional 30 days being granted, for a total of 60 days for public review. Two public meetings were held on October 8 in Lima, Montana and on October 9 in Dillon, Montana. These meetings were announced in the planning update and through the local and statewide media. Over thirty individuals participated in these meetings. A short presentation was given on the draft plan, followed by an opportunity for participants to offer comments. All comments needed to be received or postmarked by November 26, 2008.

In addition to oral and written comments received during these public meetings, the planning team received over 100 additional written comments during the public review process. The planning team reviewed all comments both individually

and as a team. Numerous modifications, including clarifications, were made to this final document based on the public review. Responses to substantive comments are summarized in appendix A.

STATE COORDINATION

At the start of the planning process, the U.S. Fish and Wildlife Service's region 6 director sent a letter to MFWP, inviting them to participate in the planning process. Since then, numerous state biologists have been involved in the planning process and have also participated in biological reviews of the refuge's management program. At the start of the process, the offices of each of the three state members of Congress (then Senator Conrad Burns, Senator Max Baucus, and Representative Dennis Rehburg) were sent letters notifying them of the planning process and inviting them to comment on the plan. Four other Montana state senators and representatives and Governor Brian Schweitzer were sent similar letters. The state was provided copies of both the internal and public review drafts. Based on state comments, various changes were made to the final CCP.

TRIBAL COORDINATION

Early in the planning process, the U.S. Fish and Wildlife Service's region 6 director sent a letter to tribes identified as possibly having interest in participating in the planning efforts at Red Rock Lakes National Wildlife Refuge. Those contacted were the Northern Cheyenne, Crow, Eastern Shoshone, and Arapaho tribal councils. The tribal councils did not submit responses to the region 6 letter; nevertheless, the councils were provided planning updates and opportunities to comment. During public review of the draft CCP, we received a comment that several other tribes may have

historically used the Centennial Valley and the refuge at one time. These tribes included the Nez Pierce, Confederated Salish and Kootenai, Shoshone-Bannock, and the Blackfeet Nation. We provided each a copy of the public draft and offered 30 days in which to comment on the document. No comments were received.

PLAN AMENDMENT AND FINAL DECISION

An intra-Service Section 7 evaluation was completed on the document by the Service's Ecological Services office to evaluate impacts to threatened and endangered species (See appendix C). The Service's region 6 regional director considered the environmental effects of each alternative and the public comments on the draft document and approved alternative B as Red Rock Lakes National Wildlife Refuge's final 15-year comprehensive conservation plan. The decision is disclosed in a finding of no significant impact (FONSI) included in this CCP (appendix E). Implementation of the CCP will begin with the regional director's signature and publication of the final CCP. The final compatibility determinations are found in this document under appendix F. This CCP provides long-term guidance for management decisions. It establishes goals, objectives, and strategies (chapter 4) needed to accomplish refuge purposes, and identifies the Service's best estimate of future needs.

This CCP details program planning levels that are sometimes substantially above current budget allocations and thus are primarily for Service strategic planning purposes. This CCP does not constitute a commitment for staffing increases, operation and maintenance increases, or funding for future land acquisitions.

2 The Refuge



Mike Parker/USFWS

Grass and sage habitats looking east into the Centennial Mountains.

This chapter explains the purposes, establishment, management history and the special values of Red Rock Lakes National Wildlife Refuge, the planning process, including the development of the vision and goals, and the planning issues.

2.1 ESTABLISHMENT, ACQUISITION, AND MANAGEMENT HISTORY

It is impossible to speak of Red Rock Lakes National Wildlife Refuge history without first addressing the history of the Centennial Valley where the refuge lies, and the role the refuge has played in the recovery and continued conservation of trumpeter swans, other waterfowl, and one of the last remaining endemic population of adfluvial Arctic grayling in the contiguous United States.

The Centennial Valley was well known by American Indians long before the homestead era, as evidenced from the journal writing of explorer Osborne Russell. Upon entering the Centennial Valley in 1835, Russell wrote that the valley from which “flows the head stream of the Missouri ... was full of Buffalo when we entered it and large numbers of which were killed by hunters ... We repeatedly saw signs of Blackfeet about us to waylay the Trappers ... We stopped at this place to feast on fat Buffalo” (Russell and Haines 1965).

The Centennial Valley provided good seasonal trapping and hunting grounds and was a favored route between the headwaters of the upper Big Hole River and the Yellowstone River.

In 1876, Mrs. William C. Orr, one of the partners in the P&O Ranch, named this 60-mile long, east-west running valley—the Centennial Valley—to commemorate the nation’s Centennial. Along with other ranches, the P&O Ranch summered livestock in the valley. In the late 1890s, the Centennial Valley was homesteaded. In addition, the valley and in particular this area that was to become a national wildlife refuge, was used by hunting clubs, with people traveling long distances to hunt waterfowl in the area (Beaverhead County History Book Association 1990).

The long winters and great distances to market made subsistence difficult at best, with few homesteaders remaining after the Great Depression. Many sold their land back to the Federal Resettlement Administration during the 1930s.

TRUMPETER SWANS AND OTHER WATERFOWL

Winston E. Banko was refuge manager of Red Rock Lakes National Wildlife Refuge from 1950–57. Much of the following history is from his 1960 Monograph “The Trumpeter Swan; Its History, Habits and Population in the United States” (Banko 1960).

Like so many other species of wildlife in North American history, the trumpeter swan was exploited for economic reasons. This fact, perhaps more than any other, caused a decline in numbers and range of this species. By early accounts, the trumpeter was relatively abundant in North America but declined by the late 1800s because the plumage of these great birds was valued by early colonists as an article of frontier commerce. Their skins were used for the manufacture of powder puffs and clothing adornment with most of the early market in Europe. The quill feathers made for excellent pens.

During the late 1820s the traffic in swan skins apparently increased. C.P. Wilson, editor of the Hudson's Bay Company publication, "The Beaver," furnished notes regarding the Company's trade in swan skins. He wrote, "In regard to the old sale lists ... 5,072 skins were sold in London on 16th April, 1828, and on the following 10th December 347,298 goose, swan and eagle quills and wings were sold. On the 29th October that year the Company imported 4,263 swan skins from York Factory and Mckenzie River Districts" (Banko 1960).

In 1828, John James Audubon set down a significant account of an Indian swan hunt. These notes record "the taking of swans specifically for their plumage in the United States proper." Audubon's account describes the deliberate killing of at least fifty swans by Indians near the confluence of the Mississippi and Ohio rivers (in Kentucky), the skins of which were "all intended for the ladies of Europe" (Banko 1960).

Although the original status of early swan populations inhabiting the Centennial is obscure, their occurrence can be traced from early times. From the 1880s to 1910, the early existence of these birds in the area is outlined. This also agrees with information collected by George Wright and Ben H. Thompson, though the actual level of these populations was never recorded (Banko 1960).

Exploitation of swans continued in the Red Rock Lake area right up until establishment of the refuge. Some duck clubs in the area of today's refuge were shooting the birds when opportunity presented itself. The Wetmores and the Hansons, local residents, were selling live captured birds for as much as \$50 apiece to zoos, parks, aviary owners, and wealthy buyers until at least 1919 (Giles et al. 2006).

The plight of the trumpeter swan was a symptom of the widespread assault on wetlands and the overharvesting of waterfowl, all of which was compounded by the drought of the early 1930s, classically known as the Dust Bowl era. Conservation-minded citizens wanted the government to save waterfowl and their habitat. Conservation giants Aldo Leopold and Ding Darling emerged to persuade the government that there was a problem, and to present a plan for acquiring wetland habitat. As newly appointed head of the

Biological Survey, Darling hired J. Clark Salyer as the new chief of refuges, to select lands where new refuges could be established and wetlands could be restored to bring waterfowl back from the brink of extinction. The Migratory Bird Hunting and Conservation Stamp Act, key legislation providing funding for federal acquisition of waterfowl habitat through the sale of the Federal Migratory Bird Hunting and Conservation Stamp, was passed in 1934 (Banko 1960).

In 1934 George Wright, Roger Toll, and Ben H. Thompson, all employees of Yellowstone National Park (YNP), were concerned about the plight of the trumpeter swan. The Red Rock Lake area was their last stronghold near YNP and for that matter in the contiguous United States. The U.S. Biological Survey had considered the area for refuge status in the early 1920s, recognizing the value of the area to waterfowl (Sperry 1922). However, local duck clubs persuaded decision-makers not to proceed. George Wright and Ben Thompson persuaded Ding Darling to reconsider the Red Rock Lakes area in 1934. In 1935 Mr. Basyl Kercheval, of the U.S. Biological Survey, wrote a report and indicated that, "The economic situation is grave. A large part of the land is mortgaged. Taxes are delinquent in many cases. Livestock in very (sic) instance is mortgaged to various agencies for feed. It is conceded by every one that the Red Rock Lakes area has been the foremost breeding, nesting and resting place for migratory waterfowl with the state of Montana" (Kercheval 1935).

All of these efforts led to President Franklin D. Roosevelt establishing Red Rock Lakes Migratory Waterfowl Refuge (later named Red Rock Lakes National Wildlife Refuge on July 19, 1961) under Executive Order 7023, signed on April 22, 1935, "as a refuge and breeding ground for wild birds and animals." On September 4, 1935, President Roosevelt enlarged the refuge under Executive Order 7172, "provided, that any private lands within the areas described shall become a part of the refuge upon the acquisition of title or lease thereto by the United States."

Although trumpeter swans and other waterfowl populations have rebounded considerably from the time the refuge was established, the Service recognizes its continued role in conserving these populations. The refuge continues to provide critical nesting, breeding, and resting areas for migratory birds. Additionally, the refuge recognizes its role in meeting regional, national, and international migratory bird conservation objectives by participating in such collaborative efforts as the "North American Waterfowl Management Plan" (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986) and the "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans" (Subcommittee on Rocky Mountain Populations of Trumpeter Swans 2008).

ARCTIC GRAYLING

The richness of the refuge's wetlands, lakes, and streams were and continue to be of great value to a diverse suite of wildlife species including native Westslope cutthroat trout and one of the last known endemic populations of adfluvial Arctic grayling in the contiguous United States.



Endemic adfluvial Arctic grayling.

This endemic Arctic grayling population has long been recognized by the Service as an important priority species on the refuge. A letter dated July 15, 1941 from the Service states, “the streams on Red Rock Lakes Refuge are some of the more important grayling streams in the United States, and it is the desire of the Division of Wildlife Refuges to preserve these streams for this purpose.” This same letter discusses how the planting of all nonnative fish, particularly eastern brook trout, should be prohibited to protect grayling (Leach 1941). A letter dated June 15, 1952 from the state of Montana to the Service describes the Red Rock drainage, which flows through the refuge, as a grayling sanctuary where all steps possible would be taken to preserve this unique population of grayling. It discusses how grayling and cutthroat trout were negatively impacted by the introduction of nonnative fish including rainbow trout, eastern brook trout, and brown trout (Allen 1952). There are numerous other documents over the years, many generated by the Service including refuge managers, that describe a grayling sanctuary on the refuge and the importance of managing for the conservation of this species. Today, Arctic grayling in the Centennial Valley remain imperiled and are a species of concern in the state of Montana.

OTHER WILDLIFE

The refuge's conservation role has continued to expand over the years. This is particularly true in the conservation and recovery of imperiled migratory land birds, a management responsibility of the U.S. Fish and Wildlife Service. In 1990, the Partners in Flight program was launched in response to growing concerns about population declines of many land bird species that were not included in existing conservation initiatives. The overall objective of this initiative is to help species at risk while “keeping

common birds common.” The refuge is an important area for numerous Service and state recognized species at risk, including Brewer's sparrow and Swainson's hawk. The refuge's grassland, riparian, and shrub-steppe habitats are important nesting and feeding areas for these and numerous other resident and migratory land birds. Historically, efforts were made to monitor these populations and properly manage their habitats, however, much is left to be learned and done to ensure their survival and conserve these species.

There are other numerous resident wildlife species that depend on the rich resources found on this refuge for all or part of their lifecycle. Many of these are state-managed species, such as the Shiras moose and Rocky Mountain elk. The refuge has a long history of cooperatively managing these native wildlife species to meet state and refuge management objectives.

LAND PROTECTION AND ACQUISITION HISTORY

During the 74 years since the executive boundary was established, the U.S. Fish and Wildlife Service has continued to acquire lands by purchase from willing landowners and acceptance of donations. The Service currently owns 48,955 acres within this approved boundary (see figure 5). Table 2 summarizes the acquisition history and the means of acquisition between 1935 and 2008.

CENTENNIAL VALLEY CONSERVATION EASEMENT PROGRAM

The refuge expanded its conservation efforts in the Centennial Valley in March 2001 through the initiation of a Centennial Valley Conservation Easement Program. This work is outlined in an environmental assessment and land protection plan (USFWS 2001). The purposes of the Centennial Valley Conservation Easement Program are to

- protect native wet meadows, wetlands, uplands, and mountain foothills from future conversions to second and recreational home uses;
- protect habitat integrity by preventing fragmentation;
- preserve key wilderness values and views throughout and adjacent to Red Rock Lakes National Wildlife Refuge;
- promote landscape integrity in order to maintain, sustain, and enhance the historic plant, animal, and insect biodiversity of native prairie habitats and associated ranching heritage;
- minimize invasive plant infestations from soil disturbance, road building, and increased traffic resulting from rural housing development;

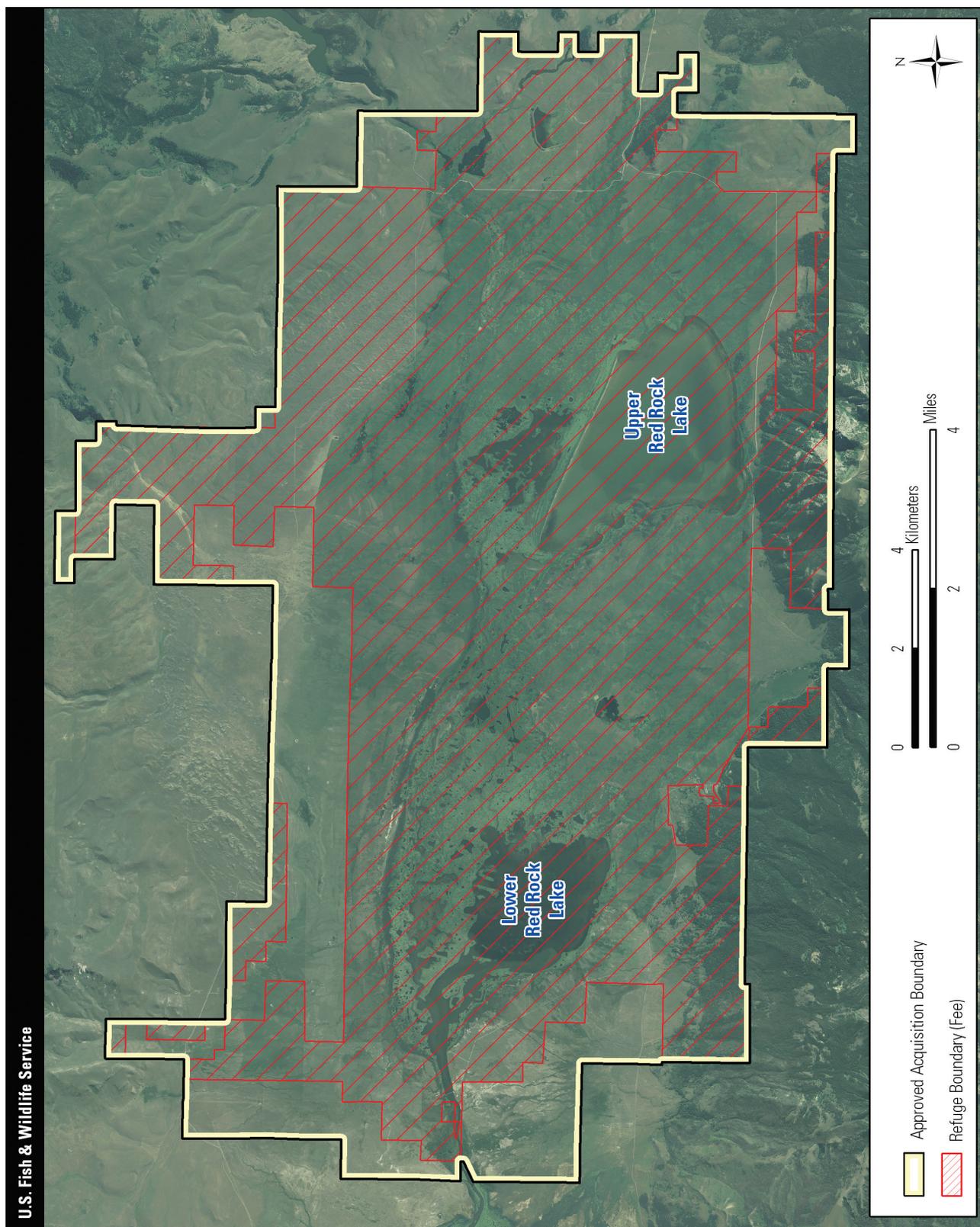


Figure 5. Red Rock Lakes National Wildlife Refuge approved acquisition boundary and acquired lands—refuge base map.

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2008.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
4/22/35	9,218	Reserved from Public Domain
4/23/35	594	Reserved from Public Domain
12/2/35	160	Acquired by Resettlement Administration
12/5/35	929	Acquired by Resettlement Administration
12/6/35	212	Acquired by Resettlement Administration
12/7/35	1,912	Acquired by Resettlement Administration
12/12/35	3,209	Acquired by Resettlement Administration
12/17/35	160	Acquired by Resettlement Administration
12/18/35	880	Acquired by Resettlement Administration
12/21/35	1,030	Acquired by Resettlement Administration
12/31/35	480	Acquired by Resettlement Administration
1/14/36	360	Acquired by Resettlement Administration
1/20/36	352	Acquired by Resettlement Administration
1/18/36	254	Acquired by Resettlement Administration
3/3/36	1,033	Acquired by Resettlement Administration
7/30/36	60	Acquired by Resettlement Administration
10/10/36	680	Acquired by Resettlement Administration
4/2/37	320	Acquired by Resettlement Administration
6/10/37	202	Acquired by Resettlement Administration
6/10/37	1,515	Acquired by Resettlement Administration
7/7/37	519	Acquired by Resettlement Administration
8/11/37	231	Migratory Bird Conservation Fund
8/19/37	517	Migratory Bird Conservation Fund

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2008.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
8/19/37	254	Migratory Bird Conservation Fund
10/2/37	12	Acquired by Resettlement Administration
11/17/37	1,292	Acquired by Resettlement Administration
5/16/38	3	Acquired by Resettlement Administration
7/18/39	390	Acquired by Resettlement Administration
7/18/39	307	Acquired by Resettlement Administration
7/18/39	3,447	Acquired by Resettlement Administration
7/18/39	648	Acquired by Resettlement Administration
7/18/39	296	Acquired by Resettlement Administration
7/18/39	499	Acquired by Resettlement Administration
7/18/39	820	Acquired by Resettlement Administration
7/18/39	195	Acquired by Resettlement Administration
7/18/39	8	Acquired by Resettlement Administration
7/18/39	398	Acquired by Resettlement Administration
7/19/39	4	Acquired by Resettlement Administration
3/6/40	42	Acquired by Resettlement Administration
2/25/54	1	Migratory Bird Conservation Fund
12/31/56	1	Migratory Bird Conservation Fund
9/30/76	6,855	Other
2/14/79	1	Other
12/15/86	1,673	Land and Water Conservation Fund
2/2/88	431	Land and Water Conservation Fund
2/28/88	120	Land and Water Conservation Fund

Table 2. Land acquisition history of Red Rock Lakes National Wildlife Refuge, 1935–2008.

<i>Date Acquired</i>	<i>Acres Acquired</i>	<i>Means of Acquisition</i>
2/1/90	320	Land and Water Conservation Fund
4/4/90	280	Land and Water Conservation Fund
4/9/90	352	Land and Water Conservation Fund
2/3/91	320	Land and Water Conservation Fund
5/20/91	320	Gifted to the U.S. Fish and Wildlife Service
4/14/94	960	Land and Water Conservation Fund
4/30/97	480	Land and Water Conservation Fund
10/10/99	20	Migratory Bird Conservation Fund
10/11/99	20	Gifted to the U.S. Fish and Wildlife Service
12/15/07	2,159	Migratory Bird Conservation Fund and Federal Land Transaction Facilitation Fund
2008	1,200	Migratory Bird Conservation Fund and North American Wetlands Conservation Act
Total	48,955	

- minimize, to a lesser extent, future demands on local government resources necessitated by providing services associated with increasing rural development.

Today, the refuge works with landowners to manage nine conservation easements totaling 20,342 acres (see figure 6). Table 3 summarizes the acquisition history of this program since 2001.

MANAGEMENT HISTORY

Red Rock Lakes National Wildlife Refuge is one of the most remote refuges in the contiguous United States. It is located in the Centennial Valley in southwestern Montana in Beaverhead County, 47 miles west of West Yellowstone and 38 miles east of the town of Lima. This 48,955-acre refuge sits at 6,670–9,400 feet above sea level and lies east of the Continental Divide near the uppermost reach of the Missouri drainage.

Historically, management focused on protecting and enhancing the trumpeter swan population at the refuge. In the 1930s, the refuge and surrounding area was their last known breeding location. Management actions included winter feeding, transferring swans

to other suitable habitats, managing wetland habitats for breeding swans, and minimizing illegal harvest and disturbance (especially during breeding). Trumpeter swans were studied intensively at the refuge, and much of what is known about their breeding biology was published in *The Trumpeter Swan*, written by former refuge manager Winston E. Banko (Banko 1960). Today, the refuge continues to support a robust population of trumpeter swans, but heroic population enhancement efforts, such as winter feeding and translocation are no longer necessary or appropriate for swan conservation, and have been phased out. The refuge continues to focus on providing quality wetland habitats for nesting swans. This has resulted in a steady increase in the number of trumpeter swans in the Centennial Valley since the mid-1990s.

The refuge has one of the most naturally diverse areas in the Refuge System. The refuge boasts the largest wetland complex within the Greater Yellowstone Ecosystem, as well as expansive tracts of grassland and sagebrush-steppe habitats, and a small amount of midelevation forested areas. These habitats support over 230 species of birds, including peregrine falcons, bald eagles, short-eared owls, sandhill cranes, sage grouse, and numerous species of

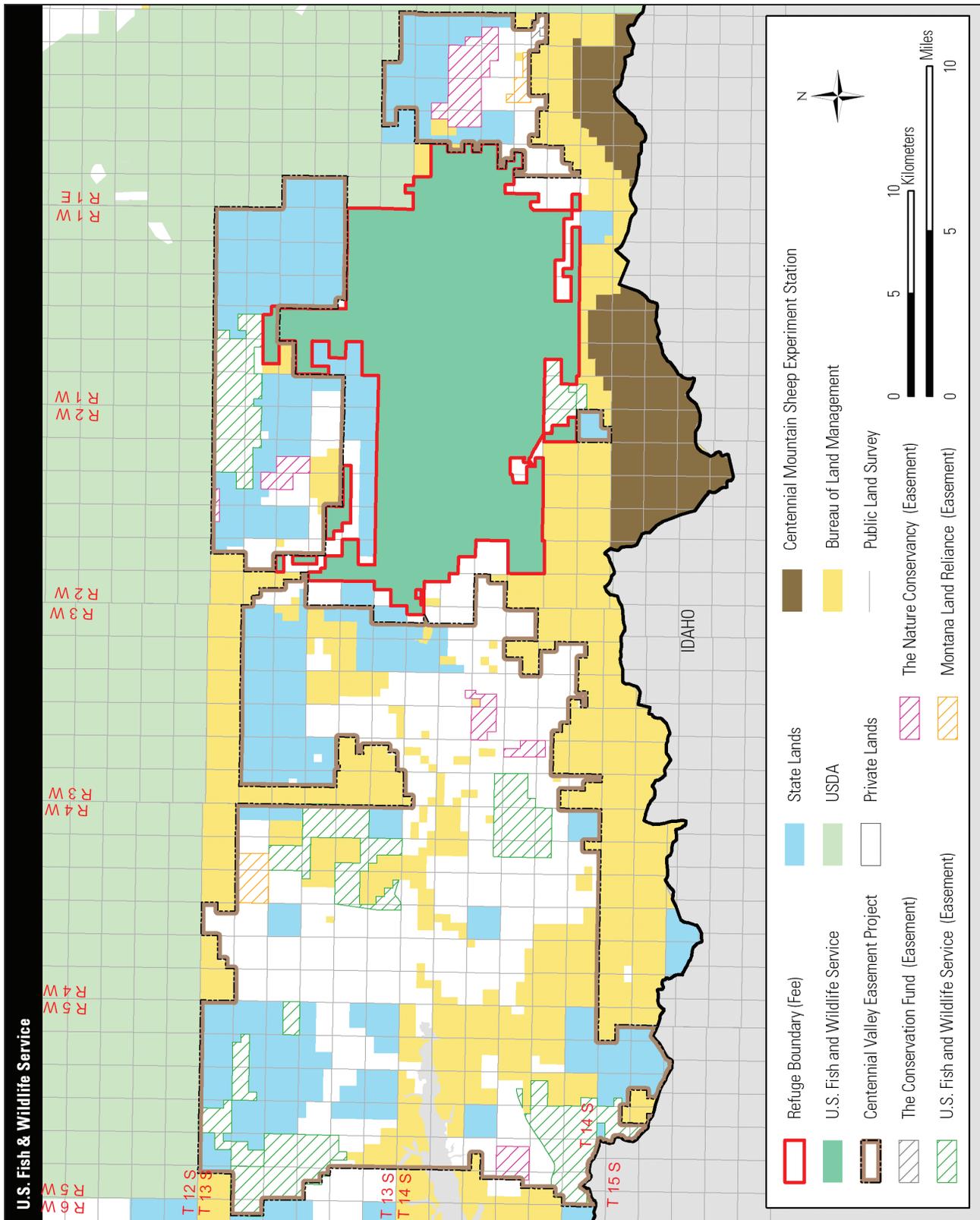


Figure 6. Conservation easements within the Centennial Valley.

Table 3. Conservation easement acquisition history within the Centennial Valley, 2001–2008.

<i>Year Acquired</i>	<i>Means of Acquisition</i>	<i>Total Acres</i>
2001	Land and Water Conservation Fund	2,376
2002	Land and Water Conservation Fund	3,771
2003	Land and Water Conservation Fund	188
2003	Land and Water Conservation Fund	1,361
2003	Land and Water Conservation Fund	640
2004	Land and Water Conservation Fund	990
2004	Land and Water Conservation Fund	3,404
2005	Land and Water Conservation Fund	4,137
2006	Land and Water Conservation Fund	3,346
2008	Land and Water Conservation Fund	129
Total		20,342

waterfowl and waterbirds (see appendix G). Common mammals include Shiras moose, Rocky Mountain elk, mule and white-tailed deer, badger, coyote, and red fox. In recent years, wolves and grizzly bears have been documented using the refuge. There is also a remnant population of endemic adfluvial Arctic grayling that occurs on the refuge.

A full-time staff of five and various seasonal employees manage and study the refuge habitats and maintain visitor facilities. Domestic livestock grazing and prescribed fire are the primary management tools used to maintain and enhance upland habitats. Currently, four grazing cooperators are using refuge lands. Water level manipulation occurs in some areas of the refuge to improve wetland habitats.

Approximately 12,000 people visit the refuge annually. Two refuge roads and three county roads that pass through the refuge account for the majority of visitor use. Visitors also use the trails at Sparrow Pond and Odell Creek to access the refuge. The refuge is open to limited fishing, with the majority of fishing occurring on Red Rock Creek where anglers can catch Arctic grayling, rainbow trout, Yellowstone cutthroat trout, and brook trout. In addition, the refuge is open to limited hunting of ducks, geese, coots, elk, pronghorn, moose, and mule and white-tailed deer.

2.2 SPECIAL VALUES OF THE REFUGE

Early in the planning process, the planning team and public identified the outstanding qualities of Red Rock Lakes National Wildlife Refuge. Refuge qualities are the characteristics and features of the

refuge that make it special, valuable for wildlife, and worthy of refuge status. It was essential during the planning process to identify these special values to ensure that they are conserved, protected, and enhanced. Refuge qualities can be unique biological values, as well as something as simple as “a quiet place to see a variety of birds and enjoy nature.” There are many attributes that make Red Rock Lakes National Wildlife Refuge unique and valued because it

- is located in the middle of an important wildlife corridor linking the Greater Yellowstone and Bitterroot ecosystems (Merrill and Mattson 2003, Servheen and Sandstrom 1993, Walker and Craighead 1997);
- protects over 69,000 acres of the Centennial Valley in southwest Montana—the least developed valley of its size in the state;
- encompasses the largest wetland complex in the Greater Yellowstone Ecosystem;
- contains 3,300 acres of sandhills habitat—one of only two places this habitat can be found in Montana;
- represents one of the most diverse refuges in the United States, with forty-five identified vegetation associations according to the National Vegetation Classification System (Anderson et al. 1998);
- plays an integral role in the contiguous restoration of trumpeter swans;
- continues to provide critical nesting habitat for a tri-state flock of trumpeter swans (those nesting in Wyoming, Idaho, and Montana);

- supports one of the last endemic adfluvial population of Arctic grayling in the contiguous United States;
- provides habitat for one of the highest-density wintering moose populations in Montana;
- is in an area that has been a gathering spot for people and wildlife throughout time;
- occurs in an area with rich paleohistory, early exploration, and settlement;
- has historic buildings originally constructed by the Works Progress Administration;
- has potential for a broad range of partnerships that are integral to every aspect of refuge management;
- provides visitors with a multitude of wildlife-dependent recreational opportunities in a remote, peaceful, beautiful setting;
- encompasses the 32,350-acre designated Red Rock Lakes Wilderness.

2.3 PURPOSES

Every refuge has a purpose for which it was established. This purpose is the foundation upon which to build all refuge programs, from biology and visitor services, to maintenance and facilities. The refuge purposes are found in the legislative acts or administrative orders that provide the authorities to either transfer or acquire a piece of land for a refuge. Over time, an individual refuge may contain lands that have been acquired under a variety of transfer and acquisition authorities, giving a refuge more than one purpose. The goals, objectives, and strategies identified in this CCP are intended to support individual purposes for which the refuge was established.

The legislative purposes for Red Rock Lakes National Wildlife Refuge include the following:

1. “As a refuge and breeding ground for wild birds and animals.” (Executive Order 7023, dated April 22, 1935)
2. “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (Migratory Bird Conservation Act 1929)
3. “Suitable for (a) incidental fish and wildlife-oriented recreational development, (b) the protection of natural resources, (c) the conservation of endangered species or threatened ... species ... The Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors.” (Refuge Recreation Act 1962)
4. “The conservation of the wetlands of the nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory

bird treaties and conventions.” (Emergency Wetlands Resources Act 1986)

5. “For the development, advancement, management, conservation, and protection of fish and wildlife resources ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude.” (Fish and Wildlife Act 1956)
6. “Wilderness areas ... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.” (Wilderness Act 1964)

2.4 VISION

A vision is a concept, including desired conditions for the future, that describes the essence of what the U.S. Fish and Wildlife Service is trying to accomplish at the refuge. The vision for the refuge is a future-oriented statement designed to be achieved through refuge management throughout the life of this CCP and beyond. The following is the vision statement developed by the planning team for Red Rock Lakes National Wildlife Refuge.

The majestic Centennial Valley of southwest Montana is an expansive mosaic of high-elevation wetlands, grasslands, shrublands, and forests framed by dramatic mountain peaks. Through partnerships and conservation programs, the valley has maintained its biological integrity and is a working landscape that remains largely undeveloped.

To this end, Red Rock Lakes National Wildlife Refuge is a conservation leader in the valley working to maintain, mimic, and where appropriate, restore natural processes to create and sustain native habitat for migratory and resident fish and wildlife. Visitors have a sense of solitude and wildness that lifts their spirits and stirs their souls. This first-hand experience with the refuge encourages people to participate as stewards, not only of the refuge, but also of the natural resources in their own communities.

2.5 GOALS

The U.S. Fish and Wildlife Service developed a set of goals for the refuge based on the National Wildlife Refuge System Improvement Act, the refuge’s

purposes, and information developed during project planning. The goals direct efforts toward achieving the vision and purposes of the refuge and outline approaches for managing refuge resources. The Service established six goals for the refuge.

LAKE, POND, AND MARSH HABITAT GOAL

Provide habitat for breeding and staging migratory birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.

RIPARIAN HABITAT GOAL

Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for migratory breeding birds, native fishes, and wintering ungulates.

WET MEADOW, GRASSLAND, AND SHRUB-STEPPE HABITAT GOAL

Provide structurally complex native meadow, grassland and shrub-steppe habitats, within a watershed context, for upland-nesting migratory birds, sagebrush-dependent species, rare plant species, and other resident wildlife.

ASPEN FOREST, MIXED CONIFEROUS FOREST, AND WOODLAND HABITAT GOAL

Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrubland for cavity-nesting birds and other migratory and resident wildlife.

VISITOR SERVICES AND CULTURAL RESOURCES GOAL

Provide quality wildlife-dependent recreation, environmental education, interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural resources of the Centennial Valley for visitors and local community members of all abilities, while maintaining the primitive and remote experience unique to the refuge.

REFUGE OPERATIONS GOAL

Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

2.6 PLANNING ISSUES

Several key issues were identified following the analysis of comments collected from refuge staff and the public and a review of the requirements

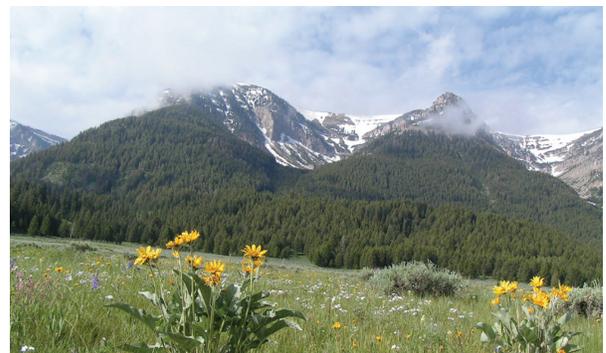
of the Improvement Act and NEPA. Substantive comments (those that could be addressed within the authority and management capabilities of the U.S. Fish and Wildlife Service) were considered during formulation of the alternatives for future management. Challenges abound within the National Wildlife Refuge System, and these issues will have to be reviewed, changed, and added to as management actions are put into place and as environmental and social issues interact with refuge purposes and plans. The key issues identified during this planning process are summarized below.

HABITAT AND WILDLIFE MANAGEMENT ISSUES

Habitat Loss and Fragmentation Caused by Residential Development

Habitat loss is the greatest threat faced by North American wildlife. Maintaining the integrity of existing habitats and providing linkage zones between existing habitats is a key wildlife conservation strategy. Centrally situated between the Greater Yellowstone and Bitterroot ecosystems, two of the most intact, biologically diverse ecosystems in the contiguous United States, the refuge is ideally located to be a conservation leader to protect the Centennial Valley from fragmentation and residential development.

Successful conservation leadership is attained through the development of partnerships. Working with conservation partners, local residents, and the Service's Partners for Fish and Wildlife Program, the refuge works to preserve the integrity of the Centennial Valley through conservation easements. These easements prevent further residential or commercial development while fostering the relationships necessary to pursue habitat improvements on adjacent private lands. The refuge also partners with state and other federal agencies, and nongovernmental organizations to address local and regional wildlife management challenges. For example, efforts to improve the current status of Arctic grayling in the Red Rock Creek watershed have led to partnerships with MFWP, The Nature Conservancy, and the U.S. Fish and Wildlife Service Management Assistance Office.



Red Rock Lakes National Wildlife Refuge.

Grazing

Demonstrating good stewardship of refuge lands is another example of how the refuge can be a conservation leader. Managing refuge resources based on the best available knowledge should be the starting point for management actions. This does not ensure success or lack of controversy due to the uncertainties regarding relationships among wildlife, habitat, and management activities. For example, the current grazing program on the refuge draws considerable criticism. It is known that Centennial Valley grasslands evolved with grazing by large native ungulates such as bison. The refuge currently provides that disturbance via cattle grazing, a controversial practice on public lands in the American West. While several public comments were supportive of a scientifically-based grazing system designed to benefit wildlife, there was also support for the termination of the grazing program and repatriation of bison on the refuge.

Currently, the refuge has an Upland Management Plan that was written in 1994. The selected alternative was “Adaptive Management by Prescription.” Although details of how this management alternative would be carried out are described, this plan was never fully actualized. The grazing program is currently run on what is a 3-year grazing unit rest-rotation cycle with very little monitoring of grazing impacts on habitats. In addition, fences have been removed or allowed to deteriorate, resulting in large units that preclude “short duration—high intensity” grazing as prescribed in the 1994 plan. Changes in the grazing program must take place in order for this to be an effective management tool for habitat manipulation and wildlife benefit.

Red Rock Lakes Management

Wetlands in the Intermountain West region provide important habitat for migratory birds and other wetland-dependent wildlife. Similar to wetland habitats in other regions of North America, agriculture and development have resulted in the loss of approximately 57% of Intermountain West region wetlands to drainage (Ratti and Kadlec 1992). The significance of this loss is magnified due to the region’s largely arid landscape. However, management of these habitats is hindered by the relative scarcity of information on the ecology of montane wetlands, making it difficult to predict the response of these habitats to management actions intended to improve habitat quality for migratory birds. Montane wetlands are a type of high-elevation wetland, located just below the subalpine region. Greater understanding of montane wetland ecology would therefore improve the ability of managers to make sound science-based decisions regarding management of these important flyway resources.

Refuge lakes and wetlands management is a broad priority encompassing Lower and Upper Red Rock lakes, Swan Lake, River Marsh, and associated wetland areas. River Marsh referred to in this document is the marshy areas along Red Rock Creek, between Upper and Lower Red Rock lakes. Species (such as swans, other waterfowl, ibis, grebes, gulls, and fishes) using this system of wetlands are inherently included in this priority. Current refuge objectives for wetland habitat management are to mimic disturbance processes believed necessary for maintaining ecological function of montane wetlands. The primary process is the dynamic wet/dry hydrological cycle, a key driver of wetland productivity and vegetation community structure.

Lower Red Rock Lake and the lower River Marsh have been influenced by a water control structure (WCS) at the western boundary of the refuge since 1930. There are concerns that the WCS may be negatively affecting the hydrological system of Lower Red Rock Lake and River Marsh. Increasing temperatures and decreasing precipitation have also raised concerns regarding reduced water resources in the future and the impact on refuge wetland habitats. There is a question as to whether this structure would need to be used as a management tool to capture water resources or if it should be removed.

Arctic Grayling

The restoration of wildlife populations and habitats has been a common theme of the planning process and public comments, and Arctic grayling are a particularly poignant example. The refuge population of Arctic grayling represents one of the only naturally occurring adfluvial populations in the contiguous United States. Currently, spawning numbers are very low. In addition, Arctic grayling are not spawning in most of their traditional spawning creeks (such as Tom Creek). Spawning only occurs in Red Rock and Odell creeks, putting this population at additional risk.

Shiras Moose

Shiras moose, a subspecies of moose found in the central Rocky Mountains, commonly occur on the refuge. The state permits hunting of moose in Montana through a drawing for a limited number of permits, some of which are issued in the unit encompassing the refuge. Numerous comments were received from the public addressing the refuge’s moose management and hunting programs. Many believed that moose populations have declined, stating that it is more difficult to view a moose on the refuge than in the past. MFWP winter survey data indicate moose numbers are relatively high and increasing on the refuge. Conversely, recent assessment of key moose habitat on the refuge indicates that there may have been a reduction in

willow browse intensity. This change in browse activity could be due to an undetected decline of moose or a redistribution of moose during nonwinter periods. Like many ungulates, moose will move into areas that have been recently disturbed by fire. A wildland fire in the Centennial Mountains in 2003 burned over 14,000 acres, stimulating new aspen growth, a favorite food source of moose. If moose are capitalizing on this new growth during the summer, this would lead to their dispersion, a reduction in observation opportunities for visitors, and the perception of an overall decline in moose abundance.

Refuge moose management is coordinated with the state to manipulate harvest for population regulation. Although the refuge comprises only a small proportion of the hunting district, a high percentage (approximately 90%) of moose harvested in the district are taken on refuge lands. Basic information regarding population status and trends, population structure, and landscape-level habitat use patterns is needed to assess the possible impacts of current management on both consumptive and nonconsumptive uses on the refuge.

Willow and Aspen Habitats

Herbivory (consumption of vegetation) frequently produces a landscape that would not have been created by the physical environment alone. Browsing by ungulates can reduce the survival and competitive reproductive capacity of trees and shrubs, resulting in alterations to the structure and dynamics of plant communities. For example, Berger et al. (2001) found willows to be taller and have greater volume where moose densities were limited by predation (in the form of hunting). Similarly, elk overabundance has been linked to reduced regeneration of aspen in the Rocky Mountains (Romme et al. 1995).

Winter surveys conducted by MFWP between 1966 and 2009 show that winter moose abundance in and around the refuge has increased by more than 2% annually throughout the period surveyed. Elk populations in southwestern Montana have experienced similar population growth. High browse intensity on aspen and willow has been documented in portions of the Centennial Valley, including refuge riparian habitats. This has led to concerns regarding possible impacts on the breeding migratory land bird community. Many western land bird populations are sensitive to diminution of aspen and willow due to their reliance on riparian habitats, and many riparian bird species are experiencing regional declines. Both bird species composition and community diversity in riparian habitats are broadly associated with the diversity in height and thickness of woody vegetation. The reduction of structural diversity due to high levels of browsing may alter the attractiveness of riparian habitats to some birds.

There is general agreement among managers that browse intensity should be reduced in these

habitats. However, there is uncertainty regarding the appropriate means to reach the desired habitat condition for breeding migratory land birds.

Centennial Sandhills

The Centennial Sandhills are one of only two significant sandhill areas in Montana. It is the highest sandhill system in the northern Rocky Mountains. Five plant species found in the sandhills are listed as rare in Montana. Two of these plant species (Idaho painted milkvetch and Idaho evening-primrose) only occur in the Centennial Sandhills and the sandhills located in southeast Idaho. The continued existence of these rare plant species depends on the existence of early successional habitat, which is currently lacking in the Centennial Sandhills on the refuge. Fire and grazing are two tools that may be used to improve conditions for the rare plants. The sandhills also contain rare fauna. Four state mammal species of special concern have been documented; Preble's shrew, black-tailed jackrabbit, Great Basin pocket mouse, and pygmy rabbit. Four Montana Partners in Flight priority II bird species (Casey 2000) also use the sandhill habitat; long-billed curlew, sage thrasher, Brewer's sparrow, and grasshopper sparrow.

While much of the refuge's history has been focused on reducing the negative impacts of human activities on habitats (through reduced grazing and water diversion, and elimination of haying), this philosophy has caused problems with the management of the Centennial Sandhills. The long-term reduction of disturbances (such as fire and grazing) has resulted in loss of early seral stage habitats, such as blowouts. Seral plant communities are transitory and occur between successions of habitats. Early seral sandhill habitat supports a variety of rare flora and fauna. This is evident by the species of plants and wildlife using the sandhills on neighboring lands managed by BLM. The refuge needs to determine the frequency and intensity of disturbance necessary to achieve a desired mosaic, while minimizing impacts on species such as sage grouse and Brewer's sparrow, both dependent on late-seral sagebrush growth.



Centennial Sandhills, dominated by native sagebrush and bunchgrasses.

Mixed Conifer Management

Woodlands cover approximately 3,745 acres of the refuge. Little or no management has occurred in this habitat. Condition assessments and potential management actions need to be investigated.

Stream Restoration

There are several creeks and streams on the refuge that have been rerouted from their original streambeds. In addition, there are several streams where the riparian habitats have been degraded due to overgrazing, but have not been restored. Restoring these streams would be beneficial to fish and wildlife using the refuge.

Invasive Plant Species

Integrated pest management is an important focus to minimize infestations, especially given the relatively natural state of the refuge. Efforts continue throughout the Centennial Valley to detect and eradicate new invaders, and control existing invasive plant populations such as common tansy and spotted knapweed. Although the refuge does have most native plant species represented, some of the areas historically heavily grazed have converted to nonnative grasses, such as Kentucky bluegrass. Other invasive grass species were planted for forage, such as smooth brome. The refuge will be challenged to eradicate these hearty, widespread invasive grasses and restore treated sites.

Aquatic Nuisance Species

Red Rock Lakes National Wildlife Refuge is treasured for its natural beauty, biological diversity and plethora of recreational opportunities. The wetlands and creeks flowing from the refuge form the headwaters of the Missouri River which is of immeasurable economic importance to the United States.

The unique ecological and economic values of the refuge are now being threatened by aquatic invaders, or aquatic nuisance species. These nonnative mussels, plants, snails, and other introduced species have the potential to severely impact the region's wildlife, tourism, agriculture, hydropower, and businesses. The refuge currently is unaware if any aquatic nuisance species are present. Surveys, education, and prevention are needed to protect these important habitats.

Wilderness

Over 66% of the refuge (32,350 acres) is congressionally designated wilderness. This designation recognizes the remote setting and relatively untrammelled nature of the refuge, while protecting these very attributes for future generations. This designation does add complexity to the management of the refuge. Habitat management

may seem "inefficient" at times due to wilderness restrictions that prohibit the use of mechanized tools commonly used elsewhere. However, the Wilderness Act was designed to protect the attributes of, and not the efficiencies of managing wilderness areas.

Fire Program

A fire management plan (FMP) for the refuge was approved in 2002 to direct the refuge to manage wildland fires. The plan needs to be updated to incorporate partnering with BLM to reduce hazardous fuels around the community of Lakeview. Information is needed to carry out the use of prescribed fire on the refuge as a tool for habitat management. Prescribed fire has been implemented over the years primarily to reduce litter and hazardous fuels.

VISITOR SERVICES PROGRAM ISSUES

During the planning process it was clear that many people greatly appreciate the refuge for its wildlife, remoteness, and solitude. Designated both as a national wilderness area and national natural landmark, the refuge provides quiet, uncrowded wildlife-dependent recreation in a breath-taking setting. Many of the comments supported preserving the pristine character of the refuge.

Overall, many participants and visitors identified a need for greater public understanding and appreciation of the refuge and the recreational opportunities it offers. Many comments included poor directional signage, "unfriendly" boundary signage, inadequate brochures, outdated interpretive panels, confusing regulations, and minimal visitor center information. A number of other recreational issues became apparent during the planning process and deserve further discussion. Specific recreational concerns and issues are summarized as follows.

Hunting

Hunting for waterfowl and big game, including elk, mule and white-tailed deer, pronghorn, and moose, is a popular activity for visitors. Certain portions of the refuge are closed to big game hunting. Waterfowl hunting is limited to Lower Red Rock Lake and adjacent areas. The remaining waterbodies are designated as sanctuaries for migratory waterbirds. All hunting seasons (except for moose) follow state regulations and limits. Moose season opens on October 15, which is later than the state season. There is no commercial guiding or trapping permitted. Hunting on the refuge is important not only as a wildlife-dependent recreational activity but as a management tool to control large game that become concentrated in protected areas, damaging habitat.

The public expressed many different points of view on whether to continue to permit hunting on

the refuge. The greatest concern was over moose hunting. Many commentators believed that the moose population is being impacted by the eleven permits (on average) issued by the state each year for the hunting district in which the refuge is located. Some commentators requested that all moose hunting be stopped.

Overall, there are concerns about what species should be hunted, and with understanding the refuge's goals and objectives with respect to management of game species. All commentators agreed that law enforcement is needed to better monitor and regulate this use.

The illegal shooting of game from roads is a major concern on the refuge and in the valley. Because of the expansive views, it is possible to drive up and down the road until an animal is spotted near the road. Instead of giving fair chase and moving off the road past the right-of-way fence, it has been witnessed several times that individuals jump out of their vehicles and shoot from the road. Aside from being illegal, shooting from the road is unethical and unsafe for other hunters in the field and visitors driving the road.

Fishing

Fishing is a popular recreational activity on the refuge and is permitted on Red Rock, Odell, and Elk Springs creeks and Culver, MacDonald, and Widgeon ponds. Some of the most popular fishing is for nonnative, introduced species such as brook trout, Yellowstone cutthroat trout, and rainbow trout. The

habitat alterations on the refuge, such as damming streams to create ponds, have supported these nonnative game fish. These habitat alterations and introduced fish have had a negative impact on the populations of endemic adfluvial Arctic grayling and Westslope cutthroat trout, both species of concern and found in refuge waters. Fishing for nonnative game fish has become a popular refuge activity. A few public comments requested expanding fishing opportunities on the lakes, created ponds, and other creeks but imposing restrictive regulations. There are concerns about potential impacts of increasing fishing pressure (especially on Upper Red Rock Lake) on native fish species, breeding and staging migratory birds, and the visitor experience.

Wildlife Observation and Photography

The breath-taking scenery and abundant wildlife make wildlife observation and photography two of the most popular visitor service activities on the refuge. Most visitors independently explore the refuge, but many visitors request guidance on the best areas to view wildlife. Many of these areas are along the roads which are not improved for parking. There are two interpreted sites on the refuge, but no interpreted trails. Trails on the refuge and trails to access other public lands are minimal, in poor condition, are not interpreted, or are not listed in the general brochure. The refuge does not have an auto tour route. Numerous comments received during public scoping were in support of identifying hiking trails and other infrastructure to make wildlife observation and photography easier. Most emphasized that activities should not impact



Pronghorn are native to the refuge.

wildlife habitats or wilderness values, including the undeveloped qualities (limited and primitive signs, minimal roads, and abounding wildlife) of the refuge. Wintertime wildlife viewing is particularly challenging, given the extreme winter weather and the seasonally maintained county gravel roads.

Environmental Education, Interpretation, and Outreach

Environmental education programs are almost nonexistent. The closest schools are over 45 miles away and it can be challenging for buses to maneuver the county access roads during the school year. The refuge does not have an outdoor recreation or education specialist, and refuge-specific programs or kits are limited. The refuge's website does provide information about the refuge, its management and resources, and wildlife-dependent recreational opportunities. It does not provide any interactive activities. The refuge's remote location offers minimal opportunities to educate students about the refuge's purposes, current management programs, issues, and the importance of conserving the Centennial Valley.

The refuge interpretive program is limited. A significant portion of the refuge is wilderness, and to protect the wilderness characteristic, signage and trails are limited. There are four kiosks located at the office, entrance areas along county roads, and Upper Lake campground. There are two interpreted sites on the refuge but no interpreted trails. The refuge's general brochure has been updated and meets Service graphic standards. There is a need for an accurate fish and wildlife observation list that meets Service graphic standards. Interpretive displays in the visitor contact area found in the refuge office have recently been updated and expanded to provide information on the refuge's role within the Greater Yellowstone Ecosystem.

Campgrounds

The refuge has two primitive campgrounds, one at Upper Red Rock Lake (Upper Lake campground) and one at Lower Red Rock Lake (River Marsh campground). Although camping is not a wildlife-dependent recreational activity, these campground areas are important for refuge visitors engaged in wildlife observation, photography, fishing, and hunting. The remote location of the refuge, minimally maintained county roads, and lack of local lodging facilities have made these campgrounds essential to those visitors who wish to stay for multiple days. Most campground visitors have come to the refuge to bird watch, photograph wildlife, fish, hunt, and hike or bike the Continental Divide trails found in and around the refuge. There was overwhelming support and concern from the public to keep these campgrounds open. The refuge campgrounds are unique in that they require little maintenance by refuge staff. Visitors keep campsites clean, collect

their trash, and cause little disturbance to other campers and visitors.

Cultural Resources

The refuge has conducted limited inventories for cultural resources primarily to comply with Section 106 of the National Historic Preservation Act. The refuge has several historical structures, most of which are still being used, including the refuge office, staff housing, and maintenance facilities. It can be challenging to keep these structures functional while maintaining their historical characteristics.

Law Enforcement

The refuge has no law enforcement staff and is almost 5 hours from the nearest station with region 6 Service law enforcement staff. While most visitors respect the refuge and its resources, there will always be those who will "step outside" the laws and regulations. It is very difficult to prevent or respond to these violations without law enforcement staff on-site. The main issues include off-road use, illegal camping and hunting, and trespass. Many public comments identified the need for law enforcement for all visitor service programs to protect wildlife, visitors, and wildlife habitat.

Facilities, Staff, and Administration

The refuge is responsible for managing over 69,000 acres, both in fee title and conservation easements, all within the Centennial Valley. Current staff, funding levels, and facilities available to manage this large land base is inadequate. The refuge currently has a full-time staff of five, including two managers, a biologist, an administrative assistant, and a maintenance worker. Supporting facilities include an office, four refuge houses, one maintenance building, a bunkhouse, and one outbuilding for storage. Although the refuge has been able to conduct many refuge programs through existing resources and partnerships, visitor services programs have been limited, and there have been missed opportunities for greater understanding, conservation, and enhancement of refuge resources. Some of the specific needs include: additional baseline data for some species, more effective management of refuge habitats, better monitoring of management actions, and orienting and educating visitors. In addition there is no on-site law enforcement presence to protect visitors, wildlife, and facilities.

The refuge headquarters was recently expanded, to provide additional offices and a larger visitor contact area. Interpretive displays are being designed, highlighting the resources and wildlife that use this refuge and the Centennial Valley. Most of the remaining facilities are in need of repair, including the refuge residences, maintenance, other visitor facilities, signs, and fencing. The refuge has several

historical structures including the refuge office, fire tower, maintenance buildings, and two refuge houses. All but the fire tower are occupied, used daily, and require maintenance to not only keep them functional, but to preserve their historical character and integrity. This can be costly and time-consuming. Currently, the office visitor contact area and restrooms are designated as universally accessible. The public also asked for proper maintenance of refuge facilities, but most requested that any changes to the refuge's infrastructure be complimentary to the refuge's rugged, undeveloped character. Due to a lack of private housing surrounding this remote refuge, most current refuge employees rent government housing. There are currently four refuge houses, built between the 1930s and 1950s. The lack

of adequate housing has limited the recruitment of added staff and the expansion of refuge programs.

Most refuge roads currently open to the public are in need of repair, some due to failed bridges. Many county roads that provide access through the refuge are not recommended for passenger vehicles due to a lack of regular maintenance and inadequate drainage. There are areas with insufficient visitor parking throughout the refuge. Examples include Odell Creek trail and the willow fen, both popular with visitors.

Directional, interpretive, boundary, and entrance signs are also in need of updating.

3 Refuge Resources and Description



Staff conducting sage grouse surveys on lands adjacent to the refuge.

This chapter describes the characteristics and resources of Red Rock Lakes National Wildlife Refuge. It specifically addresses physical, biological, cultural, and socioeconomic resources, as well as recreational opportunities.

3.1 PHYSICAL ENVIRONMENT

The following sections describe physical environmental resources that may be impacted by the implementation of the CCP. Physical characteristics include climate, physiography, geography, soils, water resources, and the effects of global warming.

GLOBAL WARMING

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change effects as part of long-range planning endeavors. The Department of Energy's report, "Carbon Sequestration Research and Development," concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. The report defines carbon sequestration as "the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

The increase of carbon dioxide (CO₂) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as "global warming." In relation to comprehensive conservation planning for Refuge System units, carbon sequestration constitutes the primary climate-related effect to be considered in planning.

Vegetated land is a tremendous factor in carbon sequestration. Large, naturally occurring communities of plants and animals that occupy major habitats—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as biological "scrubbers" of atmospheric CO₂.

One Service activity in particular—prescribed fire—releases CO₂ directly to the atmosphere from the biomass consumed during combustion. However, there is no net loss of carbon because new vegetation quickly germinates to replace the burned-up biomass. This vegetation sequesters an approximately equal amount of carbon as was lost to the air (Dai et al. 2006).

Several other effects of climate change may need to be considered in the future:

- Habitat available in lakes and streams for cold-water fish such as trout and grayling could be reduced.

- Climate change could alter water resources available to refuge wetland and riparian habitats.
- Forests may change, with some plant species shifting their range northward or dying out and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat because of more frequent droughts.
- Changes in plant and animal cycles could put the migration and nesting cycles of some bird species out of synchronization with the availability of their plant food resources and animal prey.

CLIMATE

The climate in the Centennial Valley is characterized by long, cold winters and short, mild summers. Climatic data have been collected by refuge staff at Lakeview, Montana (6,690 feet mean sea level) since July 1, 1948. The data presented below were analyzed through December 31, 2005. These data were submitted to and compiled by the National Oceanic and Atmospheric Administration's Western Regional Climate Center. Information and data (such as precipitation and temperature) presented below are based on this long-term data set as analyzed by refuge staff.

Annual precipitation is highly variable, both temporally and spatially, in the Centennial Valley. Mean annual precipitation at Lakeview, Montana, is 19.69 inches (range: 10.26 inches in 2002 to 27.0 inches in 1970). Mean annual precipitation has declined significantly between 1948 and 2005 (see figure 7). In addition, precipitation in the months of December and January has declined significantly during this same time period (see figure 7); no other months showed statistically significant changes in precipitation. May and June are typically the wettest months. Precipitation during these months comprises 27% of the annual average.

Air temperature is similarly variable throughout the Centennial Valley. Mean annual air temperature at Lakeview, Montana is 34.8 degrees Fahrenheit (°F) (range: 31.49° in 1985 to 37.68° in 1981) (see figure 8). January is typically the coldest month (mean air temperature 11.21°F) and July is the warmest month (mean air temperature 58.59°F). Mean annual air temperature between 1948 and 2005 did not change significantly. However, mean temperatures in March and April have increased significantly (see figure 8); no other months showed significant changes during this time period. This indicates that spring temperatures are warmer sooner than in recent decades. The increase in March and April temperatures is similar to the pattern observed in western North America and may be a result of climate change.

PHYSIOGRAPHY AND GEOLOGY

The information contained in this section was taken from "Centennial Valley: A Journey Through Time 1820–1930 Volume 1" (Centennial Valley Historical Society 2006) and information obtained from Dr. Ken Pierce. A detailed geologic history of the Centennial Valley Region was written by Mr. Rob Thomas for the Centennial Valley Historical Society. Portions of Mr. Thomas' narrative are rewritten here with the permission of the Centennial Valley Historical Society (Thomas 2000).

The Centennial Mountains and the adjacent Centennial Valley are very recent topographic features that formed from extension and uplift of the earth's crust over the last 2 million years. The crust of the earth in the Centennial region was heated, causing it to rise, spread, and crack into mountains and valleys. The resulting uplift of the land (and formation of the Centennial Mountains) exposed rocks that record over 2.5 billion years of Earth history.

The oldest rocks exposed in the Centennial region are metamorphic and igneous rocks (known by geologists as "basement" rocks) that formed from the high pressures and temperatures produced by collisions of continents between 2.7 and 1.7 billion years ago (Archean and early Proterozoic eons) (O'Neill and Christiansen 2004). Roughly during this time, the Centennial region was part of an area geologists call the Dillon Block. The basement rocks of the Dillon Block continued to erode until about 600 million years ago (late Proterozoic Eon). At this time, the western part of the North American continent began to break apart to form a new ocean basin.

Approximately 520 million years ago (Cambrian Period), a global sea-level rise flooded the Centennial region with shallow water, covering the eroded basement rocks with oceanic sedimentary deposits. During the Cambrian period, the North American continent was located near the Earth's equator; as such, the water was tropical and teemed with animal and plant life. The hard shells of the organisms that lived in these waters were buried and cemented together to form thousands of feet of sedimentary rock called limestone. This limestone can be observed today on the steep light-colored walls on the north-facing side of the Centennial Mountains.

Over the next 320 million years, fluctuations in sea level caused the deposition of marine and nonmarine sediment in the Centennial region. The intermittent tropical waters that covered the Centennial region finally withdrew about 200 million years ago (Jurassic period). Marine and nonmarine deposition resumed again during the remainder of the Mesozoic era, but the marine waters were contained in an interior seaway that was north/south trending (connecting the Gulf of Mexico to the Arctic Ocean). The mountains along the western margin of this interior



Mike Parker/USFWS

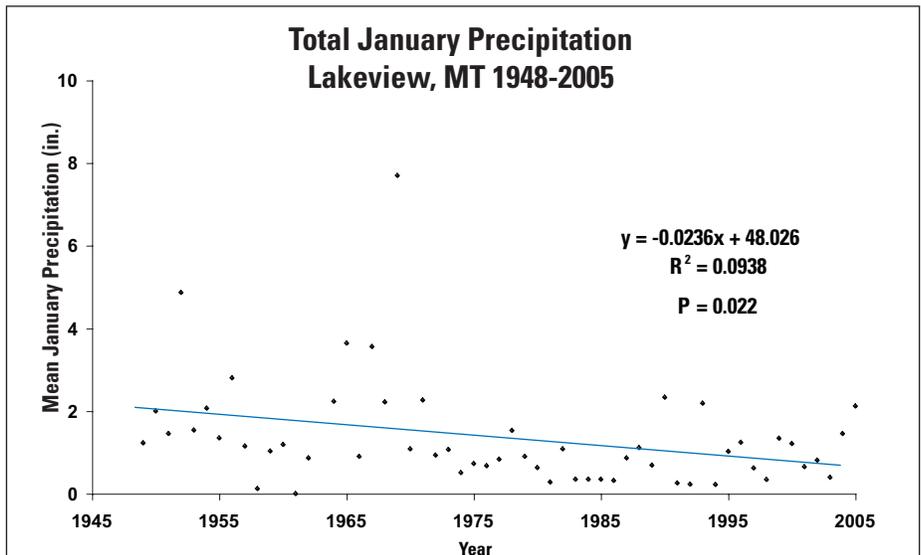
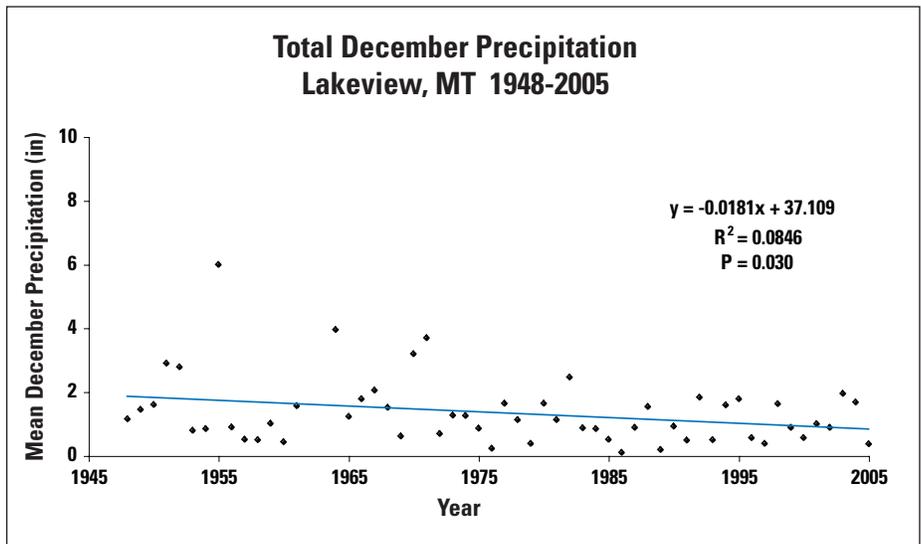
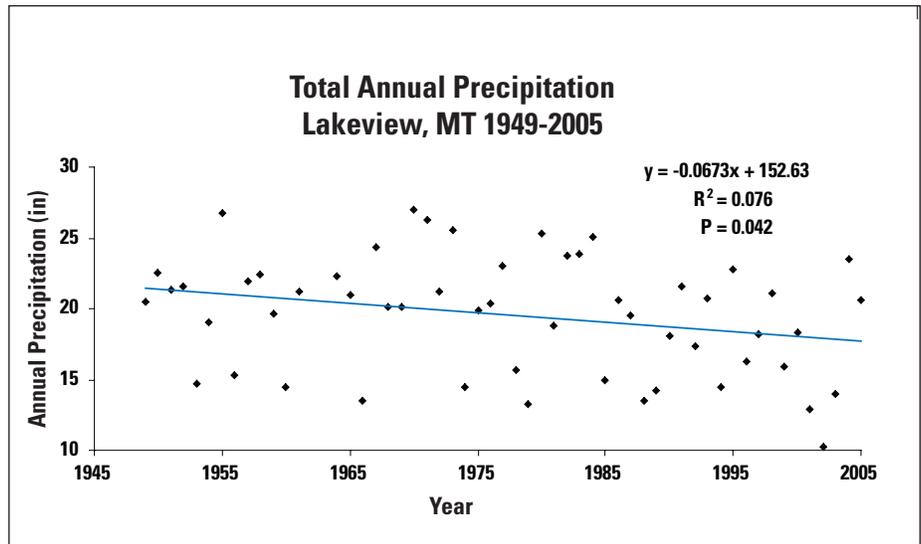
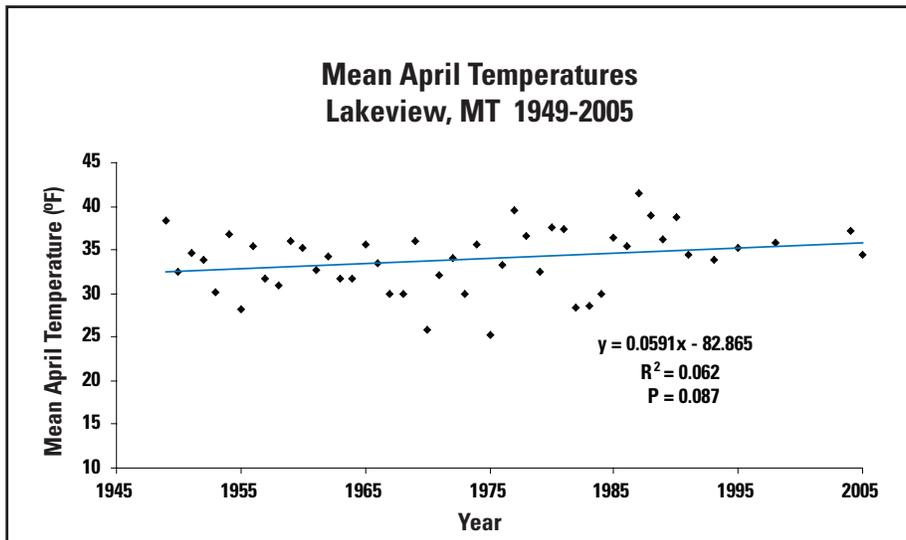
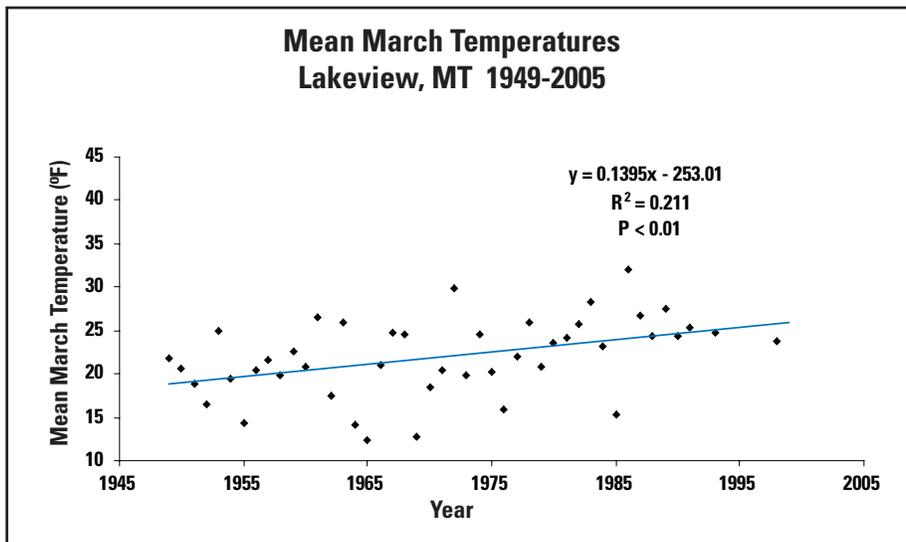
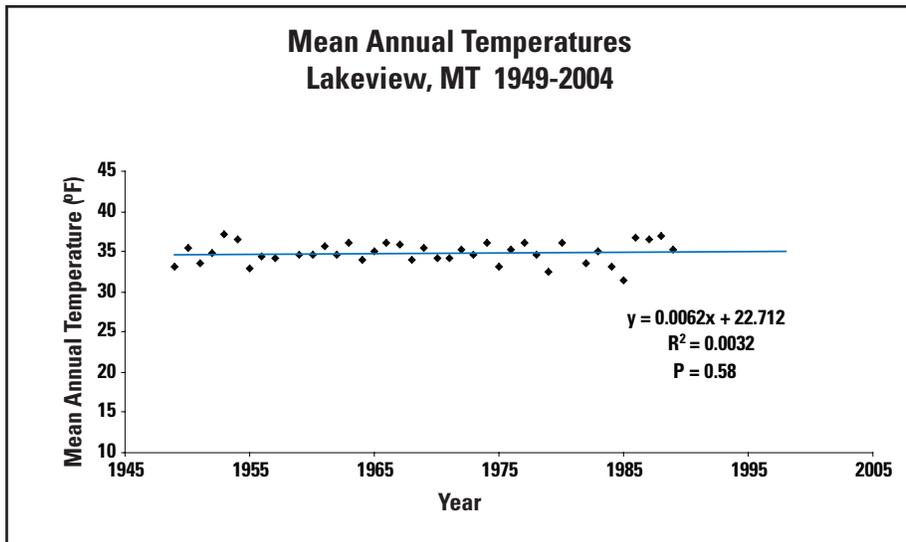


Figure 7. Significant declines in annual, December, and January precipitation totals between 1948 and 2005 (Service data).



Mike Parker/USFWS

Figure 8. Mean annual, March, and April air temperatures at Lakeview, Montana, between 1949 and 2005. Significant increases are shown for the months of March and April (Service data).

seaway consisted, in part, of a chain of volcanoes. The collision of the contiguous crust and the Pacific Ocean floor caused the production of liquid rock (magma and lava) in a process called subduction.

Approximately 80 million years ago (Cretaceous Period), the sedimentary rocks that were deposited above the basement rocks were compressed by this collision between the contiguous crust and the Pacific Ocean floor, forming features known as thrust faults. In the Centennial region, the basement rocks were also included in this folding and faulting, which helped to expose these deeply buried rocks at the surface. As the compression continued during the Cretaceous period, streams and alluvial fans carried gravel eastward away from the mountains and toward the interior seaway. The mountains also migrated eastward over time, causing the gravel to be buried and crushed by the weight of the overlying rock. The weight of the moving mountains caused the cobbles to be cemented back together—geologists call these deposits the Beaverhead Group. The deposits are well exposed near Lower Red Rock Lake.

The last 50 million years (Cenozoic Era) marks a transition from compression to extension of the Earth's crust and ultimately the formation of the valley (or basin) and range topography that are the Centennial Valley and Centennial Mountains today. This formation of the valley and range topography of the Centennial region started at least 17 million years ago (Miocene Epoch). This type of topography is formed when the crust of the Earth rises and is pulled apart or extended to form linear mountains and valleys along high-angle fractures in the crust called normal faults. The Odell Creek Fault is an example of a normal fault in the Centennial Valley.

Over the last 4 million years, westward movement of the North American continent caused the Yellowstone hot spot to move eastward and formed west to northwest trending mountains, like the Centennial Mountains (Sears and Fritz 1998, Thomas et al. 2000). The Centennial Mountains present today may have started to uplift as recently as 2 million years ago (Pliocene Epoch). The timing of the uplift is constrained by the Huckleberry Ridge Tuff, a ground-hugging volcanic ash flow that erupted from the Yellowstone and Island Park area around 2.05 million years ago (Christiansen 2001, Lanphere et al. 2002). The distribution pattern of this particular ash flow suggests that the Centennial Mountains could not have existed at the time of the eruption. As a result, the Centennial Mountain range has probably risen over 5,000 feet in the last 2.0 million years (Sonderegger et al. 1982). The faults in the area remain active today, with an average of forty earthquakes recorded each year in the Centennial Valley (Michael Stickney, director, Earthquake Studies Office, Montana Bureau of Mines and Geology, Butte, Montana; personal communication through R.C. Thomas, 2006).



The refuge has collected weather data for over fifty years.

The topography of the Centennial region was significantly modified by glacial action over the last 200,000 years (Pleistocene Epoch). Alpine glaciers deeply eroded the mountains to produce the rugged landscape of the high country and deposited glacial outwash gravels that built large alluvial fans along the northern flank of the Centennial Mountains (for example, the Odell Creek alluvial fan) (O'Neill and Christiansen 2004).

The Red Rock lakes are pluvial lakes (formed from rainfall) that formed during the last glacial period due, in part, to increased moisture. The lakes have shrunk as the climate became warmer and drier during the last 10,000 years. As the sandy shorelines of the lakes became exposed, the sand was windblown into sand dunes, forming the sandhills area in the northeastern corner of the Centennial Valley. Hot springs activity in the valley is the result of groundwater that is heated by the high geothermal gradient in the area. The heated groundwater migrates to the surface following active faults. During this glacial period, the valley was home to an array of Pleistocene mammals, including mammoths, camels, bison, horses, and saber-toothed cats. Many of these animals went extinct near the end of the Pleistocene Epoch. The first humans were in the valley by at least 10,500 years ago, as shown by radiocarbon dating of artifacts found in the valley (Albanese et al. 1995).

SOILS

Information contained in this section is taken from a soil survey (Nielson and Farnsworth 1965) that was conducted by the Soil Conservation Service in cooperation with Red Rock Lakes National Wildlife Refuge. The survey was completed in 1965.

Characteristics of the soils on the refuge are extremely varied due to changes in parent material, vegetation, and the effect of climactic forces such as wind, water, and ice. Topography and time have also had important influences. Soils range in texture from loamy sand in the Breca series to heavy clay of the Castle series. The better drained soils on the fans are predominately loamy-textured containing variable amounts of gravel, cobble, and stone. Soils in the glaciated and mountainous region vary considerably in depth and have a high percentage of rock fragment in the profile. The soil in the Centennial Mountains east of the Odell Creek drainage consists principally of carbonitic mineral. The mountainous area west of Odell Creek is both igneous and sedimentary in origin, and the soils are more clayey with less lime carbonate. The soils north of the Red Rock lakes become more sandy and have considerably less gravel in the profile.

Eleven soil association descriptions were developed for Red Rock Lakes National Wildlife Refuge as reported in the 1965 soil survey report.

Group 1. Peat and Marsh associations:

These are very poorly drained soils on the bottomlands that lie adjacent to the open-water areas and live streams. These are represented in the soils survey by marshland, peat and muck, Centennial clay, and alluvial lands, and have a 5–12 inch layer of peat over a clay mineral soil that is strongly gleyed (greenish-gray in color and oxygen-deprived due to high water content).

Group 2. Lamoure and Ching associations:

These are imperfectly to poorly drained soils on the bottomlands that are not as wet as the soils in group 1. The soils are deep and vary in texture from clay to sandy loam. They are calcareous (consisting of or containing calcium carbonate), slightly to moderately alkaline, and have water tables within moderate depths of 2–5 feet from the surface. The soils common to this group are Bug sandy loam, Centennial clay, Ching loam, and Lamoure loam.

Group 3. Arvada and Beckton associations:

These are imperfectly drained saline-alkaline soils that occur on the bottomlands but usually occupy a slightly higher position than the associated soils in groups 1 and 2. The soils are fine-textured and have a high sodium saturation at shallow depths, which makes them strongly alkaline and toxic to many plants. Strong columnar or prismatic structure in the subsoil is common to these sodic soils (containing sodium). They are frequently found in complex with many of the imperfectly drained soils in group 2.

Group 4. Breca and Breece associations:

These are well-drained sandy soils that occupy the fans and dune topography to the north of the Red Rock lakes. The majority of the soil is loamy sand in texture and erodes very easily if not protected with

vegetative cover. They are rapidly permeable and responsive to light showers.

Group 5. Sangrey and Big Elk associations:

These are well-drained soils that occupy the footslopes and fans at the base of the Centennial Mountains. They are predominately loamy-textured and contain variable amounts of gravel, cobble, and stone. They are the most maturely developed of all the soils in the survey. Other soils common to this group are the Melville, Adel, and loamy type of Breece. The Adel and Breece soils are less developed than other soils in this group.

Group 6. Castle soil associations:

These are imperfectly to well-drained heavy clay soils that occupy both smooth fans and buckled or slumped landscapes in the very southwest portion of the refuge. They are limited in area and very slowly permeable.

Group 7. Hanson and Raynesford associations:

These are well-drained, high lime soils that occupy the fans, footslopes, and glacial moraines to the south and east of Upper Red Rock Lake. They are predominately loamy textured and have a high percentage of limestone, gravel, and cobble in the profile. The Snowcrest soils in this group have a thick dark surface.

Group 8. Gilispie and Merino associations:

These are well-drained upland soils that are <20 inches deep to igneous rock (primarily Rhyolite with some Basalt scarps). They occupy moderately steep-to steep-rolling upland and occur in the northeast portion of the survey area, close to Elk Lake.

Group 9. Skaggs soil associations:

These are well-drained upland soils that are <20 inches deep to limestone rock and have a high percentage of rock outcrop. They occupy steep to very steep mountainous areas to the east and south of Upper Red Rock Lake.

Group 10. Loberg-Little Horn associations:

These are well-drained forest soil areas that occupy steep north-facing slopes of the Centennial Mountains. Douglas-fir and lodgepole pine are the dominant tree species. The soils are predominately more than 20 inches deep and are both loamy- and clayey-textured, having variable amounts of gravel, cobble, and stone. Other soils common to this group are the Whitefish soils on the glacial moraines, Wishard, Sapphire, Carnet, and Worock series.

Group 11. Rockland areas:

These are very steep mountainous areas having more than 50% rock outcrop that occupy the steep scarps of the Centennial Mountains.

WATER RESOURCES

The refuge is located in the upper end of the Red Rock River watershed. This watershed is the headwaters of the Missouri River. The refuge encompasses approximately 25,000 acres of natural, enhanced, and created wetlands. Upper and Lower Red Rock lakes have a combined surface water area of approximately 6,300 acres. These two lakes, along with Swan Lake and River Marsh area, are remnants of a post-glacial lake that is believed to have covered most of the valley floor at one time (Ken Pierce, geologist emeritus, USGS, Bozeman, MT; personal communication, 2005). This wetland complex has many sources of surface and groundwater inputs. Spring runoff plays an important role in the hydrology of the mountain creeks that flow into this wetland complex (see figure 9). Major sources of input into Upper Red Rock Lake include Red Rock and Tom creeks. In addition, Elk Springs Creek (which originates from Elk and Picnic springs) ultimately provides surface water to the Upper Red Rock Lake after the water flows through Swan Lake. River Marsh, a wetland area that connects Upper and Lower Red Rock lakes, receives surface water input from Teepee Creek. Lower Red Rock Lake has Odell Creek as a major source of input. The outlet of Lower Red Rock Lake, known as Red Rock River, flows west toward Lima Reservoir and eventually becomes the Beaverhead River.

Most Upper Red Rock Lake tributaries have their origins to the south at the eastern end of the Centennial Mountains. Red Rock Creek begins at an elevation of about 8,400 feet mean sea level (here this creek is known as Hell Roaring Creek) and flows north and west about 13 miles to the eastern shore of Upper Red Rock Lake. Tom Creek, about 6.2 miles long, originates at an elevation of 7,910 feet mean sea level and flows northwesterly toward its junction with the eastern shore of Upper Red Rock Lake. Picnic Creek originates at two large springs on the eastern boundary of the refuge. In the late 1800s, homesteaders dammed Picnic Creek, creating Culver Pond; this pond was enlarged by the refuge in 1959 to 27 acres. Widgeon Pond (132 acres), which was created by impounding Picnic Creek downstream of Culver Pond in 1964, flows into Elk Springs Creek. MacDonald Pond (5 acres) was created by impounding Elk Springs Creek near the spring heads. Elk Springs Creek flows into Swan Lake and then into Upper Red Rock Lake.

Odell Creek, the major source of surface water input for Lower Red Rock Lake, originates at an elevation of 9,200 feet mean sea level and flows north approximately 12 miles to the eastern shore of the lake. Other sources of input into Lower Red Rock Lake that originate in the Centennial Mountains and flow north into the valley include Humphrey, Duff, and Matsingale creeks.



W. Steve Sherman/USFWS

Odell Creek north of county road.

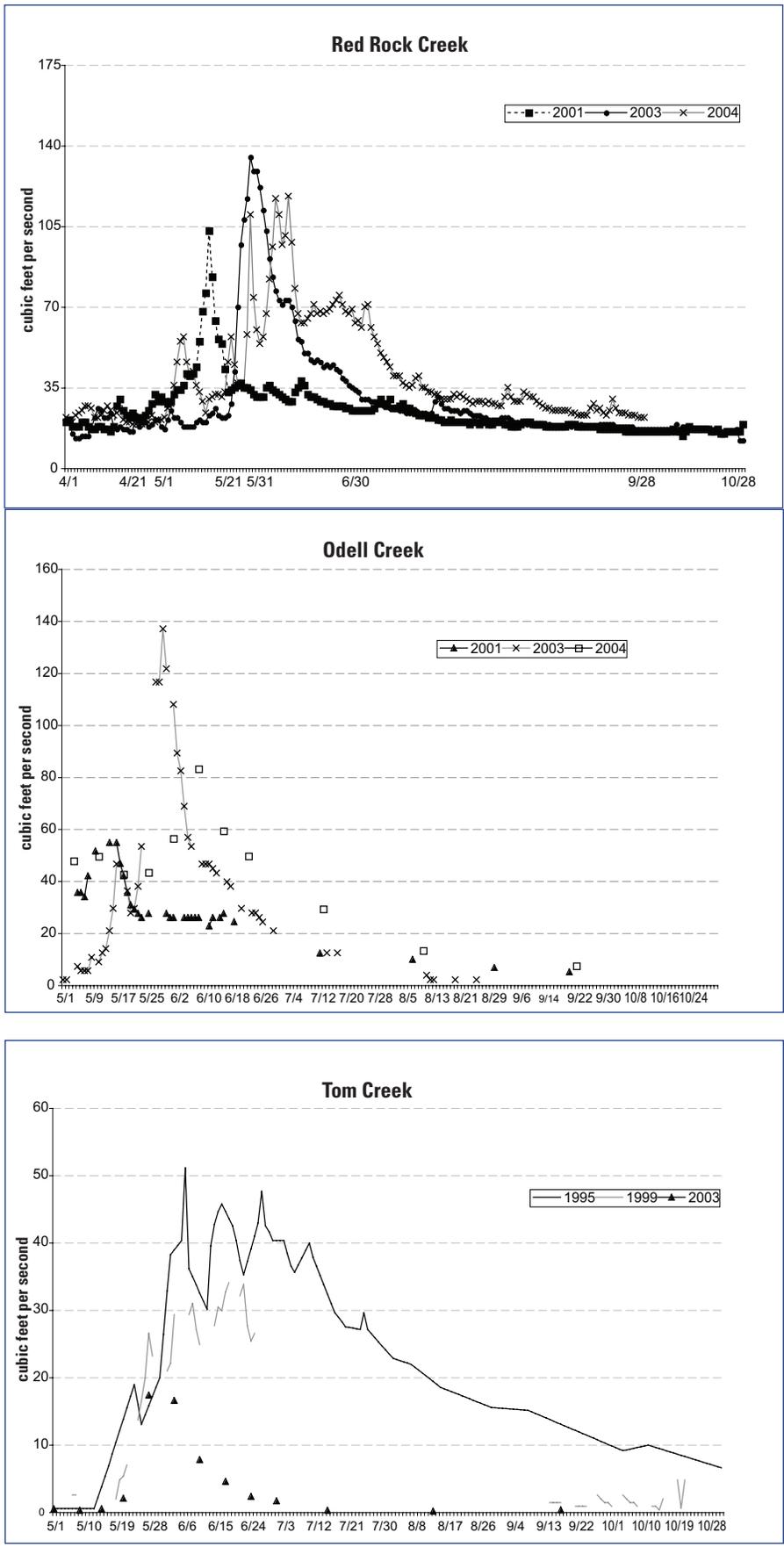
There are a few surface water inputs that flow from the north side of the Centennial Valley into this wetland complex. Teepee Creek originates on lands owned by the state of Montana and flows onto the refuge. This creek is an important source of groundwater recharge to the lands north of River Marsh (Steve Custer, professor, Earth Sciences, Montana State University, Bozeman MT; personal communication, 2006). In addition, Metzel Creek flows into Red Rock River just west of Lower Red Rock Lake. This creek is also an important source to the high water table that exists north of Lower Red Rock Lake.

WATER RIGHTS

When Red Rock Lakes National Wildlife Refuge was established in 1935, with a checkerboard of acquired private land and land reserved from public domain, there were numerous notices of appropriation that had been filed in the county courthouse. Early inspection reports documented evidence of ditches and headgates built to put water to use. Apparently, those facilities were allowed to deteriorate and refuge staff did not irrigate most of the areas for approximately 30 years.

In the 1960s the refuge manager and region 1 regional office engineers researched the water rights appurtenant to lands within the boundary and compiled a list of water rights. At the same time, refuge staff began to rehabilitate the existing irrigation systems. According to data files at Red Rock Lakes National Wildlife Refuge, between 1963 and 1971 stream measurement devices were installed and points of diversion were surveyed. There are records of measured water use for the years 1963–1971.

Most of the refuge was designated as a wilderness area in 1976. There are no records of water use for irrigation after 1973. Many of the diversion structures were removed before the actual designation of wilderness (Gene Stroops, former Red Rock Lakes refuge manager; personal communication, 2005).



Mike Parker/USFWS

Figure 9. Representative flow rates for Red Rock, Odell, and Tom creeks at Red Rock Lakes National Wildlife Refuge (Service data).

Lower Red Rock Lake Water Control Structure

The original water control structure (WCS) was built in 1930 by MFWP to stabilize the water level of Lower Red Rock Lake. In 1957 the Service constructed a second structure just upstream of the original WCS. A dam safety inspection in 1982 found several serious problems. The Service developed a plan to rehabilitate the WCS and change the operation to meet biological requirements. That plan included raising the lake's water level 2 feet for part of the year.

A new water right was needed to cover the additional storage. Anticipating objections from downstream water users whose rights were filed earlier than Red Rock Lakes rights, the Service worked with the Water Users Irrigation Company (Lima Reservoir) and East Bench Irrigation District to develop a memorandum of understanding acknowledging that the additional water to be stored was actually their water, which would be held temporarily by the refuge. In the memorandum of understanding, the Service agreed to coordinate with them about the timing of releases. Rehabilitation of the structure was completed by Ducks Unlimited in 1988.

Tucks Slough

This project was constructed in 1989 by Ducks Unlimited. Anticipating that an application for a new water right would receive objections from downstream users, the Service filed an application to change the place and purpose of use of 9.5 cubic feet per second of existing Red Rock Creek water rights from irrigation to storage. After a contested case hearing, the Montana Department of Natural Resources and Conservation (DNRC) approved the application and a permit was issued. As part of the change process, 750 acres were permanently retired from irrigation to offset the consumptive use associated with the new ponds.

Montana Statewide Water Rights Adjudication (Basin 41A)

In 1982 the Service filed use rights for 32,952 acre-feet for open-water areas and 25,979 acre-feet for marsh areas. These amounts were calculated from surface acreage multiplied by 3.3 foot average depth for open water and 1 foot average depth for shallow water and marsh habitat. In addition, based on the early notices of appropriation appurtenant to the acquired lands, claims were submitted for 32,073 acre-feet for irrigation of 12,829 acres for fish and wildlife purposes. There were several other minor claims as well.

As of 2004, only 9% of basin 41A (located in the drainage area above the Clark Canyon Reservoir) has been examined in preparation for issuing a

temporary preliminary decree. The Service could have waited for the state process to be completed. However, given the potential for objections alleging abandonment of irrigation rights, and little ability to protect streamflows for fish and riparian (river) purposes under state law, the Service opted to negotiate for federal reserved water rights. Negotiations began in 1984 and were discontinued in early 1986, due to personnel changes and conflicting priorities for the state and federal parties. In 1997 the state of Montana requested that negotiations be resumed. Numerous meetings, technical work, and coordination with local water users culminated in approval of the Water Rights Compact (compact) between the state of Montana and the United States of America, U.S. Fish and Wildlife Service, for Red Rock Lakes National Wildlife Refuge and Red Rock Lakes Wilderness. The compact was signed by the state, the U.S. Department of the Interior, and the U.S. Department of Justice in 1999. A second bill correcting errors in the consumptive use table was passed in the Montana legislature in 2001.

Technical Work

Before and during negotiations, Service hydrologists installed gauges, and refuge staff took water measurements for 3 years. Hydrologic analysis predicted high, average, and low flows for each creek and the frequency with which those flows occurred (see figure 9). The Service's Montana Fish and Wildlife Management Assistance Office, confirmed that the minimum streamflows identified by MFWP for Red Rock, Odell, and Tom creeks were sufficient to support Arctic grayling (Kaeding and Boltz 1999). Water rights claimed by upstream users were evaluated by DNRC to determine how much water was actually being used. In some cases, owners agreed to reduce their claims to reflect actual use. Several owners also signed management agreements describing how a refuge request for water from upstream users would occur.

Major Compact Provisions

The compact includes the following major provisions:

1. Protects natural flows of all streams for wildlife habitat maintenance and enhancement, subordinate to diversion rights actually existing in 1999.
2. Maintains senior minimum streamflows of 1.4 cubic feet per second in Tom Creek, 11 cubic feet per second in Odell Creek, and 15 cubic feet per second in Red Rock Creek.
3. Recognizes the natural outlet elevation of 6607.5 feet mean sea level for Lower Red Rock Lake.
4. Confirms consumptive use rights for maintenance of refuge lakes, marshes, and ponds.

5. Confirms existing uses of 8 acre-feet for the campground spring, 8 acre-feet of groundwater for residence and headquarters use, and 1.5 cubic feet per second from Shambow Creek for irrigation of the headquarter lawn.
6. Confirms that the Service retains the right to develop an additional 8 acre-feet of groundwater for future headquarters and visitor use.
7. Allows for future diversion of 3,000 acre-feet from Odell Creek for irrigation purposes.
8. The compact specifies that there will be no changes in use for natural and minimum flows, and that changes in consumptive use are constrained to the purposes of the refuge. Any changes must be made in accordance with applicable state law.
9. Montana DNRC imposed an administrative closure on the drainage basins above the refuge and will not issue any new ground permits >35 gallons per minute and 10 acre-feet per year. Small stock and domestic use from springs and wells are exempt from the closure.
10. The Service retains the right to object to inaccurate claims in the preliminary decree and may also petition courts for relief in the event of a conflict over water.

AIR QUALITY

Air quality is a global concern. The U.S. Environmental Protection Agency has lead responsibility for the quality of air. Through the 1990 Clean Air Act, the agency sets limits on the amount of pollutants that can be discharged into the air. Nationally, more than 170 million tons of pollution are emitted annually into the air within the United States borders, through either stationary sources (such as industrial and power plants) or mobile sources (such as automobiles, airplanes, trucks, buses, and trains). There are also natural sources of air pollution, such as fires, dust storms, volcanic activity, and other natural processes. The agency has identified six principal pollutants that are the focus of its national regulatory program: lead, carbon monoxide, ozone, nitrogen dioxide, sulfur dioxide, and particulate matter.

Air quality problems in Montana are usually related to urban areas in mountain valleys or river valleys that are sensitive to temperature inversions. Particulate matter and carbon monoxide are the air pollutants that have the greatest adverse impact on Montana's air quality. Particulate matter is a measure of tiny liquid or solid particles in the air that are respirable in the lungs. In the area of the refuge, carbon from automobiles (including all-terrain vehicles and snowmobiles) and diesel engines; soot from slash burning, forest fires, fireplaces, and wood stoves; and dust associated with windblown sand and dirt from roadways and fields may all contribute to

particulate matter. The major sources of particulate matter are vehicles traveling on unpaved roads and forest fires.

The refuge has a designated Class I air quality area as defined under the Clean Air Act of 1977. Air quality in the area of the refuge is considered good, with no nearby manufacturing sites or major air pollution sources. Throughout the year, occasional widespread regional smoke caused by large-scale forest fires located to the west (in Idaho, Oregon, Washington, and Montana) and annual agricultural burning that occurs in Idaho (just south of the Centennial Mountains) causes haze, which results in reduced visibility. The small particles and aerosols resulting from these fires are carried long distances in the air and cause haze in this remote location.

Emissions from snowmobiles have been an issue in nearby Yellowstone National Park. A wintertime study of snowmobile emissions indicated that particulate emissions from two-stroke snowmobile engines have a potential for visibility impacts in the Yellowstone National Park airshed (Sive et al. 2003). Investigations would need to be conducted to determine if air quality and visibility are being impacted by snowmobile use.

3.2 BIOLOGICAL RESOURCES

The following sections describe the biological resources that may be impacted by the implementation of the CCP. Biological characteristics include vegetation communities, birds, mammals, insects, reptiles, and amphibians. Unless otherwise noted, much of the following information is from unpublished Service data located in files at the refuge office.

Figures 10 and 11 show the location and composition of the various habitat types and vegetation communities described in this section and found on the refuge, as defined by the National Vegetation Classification System (Anderson et al. 1998). Data for these figures were collected during 2005–07 by refuge staff (Newlon 2007).

SHALLOW LAKE WETLANDS

Shallow lake (lacustrine) wetland habitats are defined as >20 acres in total area and having more than 30% cover of emergent vegetation. These habitats often exhibit alternative stable states (Bayley and Prather 2003). One state is characterized by hypereutrophic conditions (excessive nutrient concentration), turbid water, and pelagic (open water) phytoplankton (microscopic plants). The second state, and the current state of refuge lacustrine habitats, is characterized by clear water and submerged aquatic vegetation (SAV). Within the refuge, lacustrine wetlands cover more than 6,300 acres of habitat (USFWS 1999a) (see figure 12).

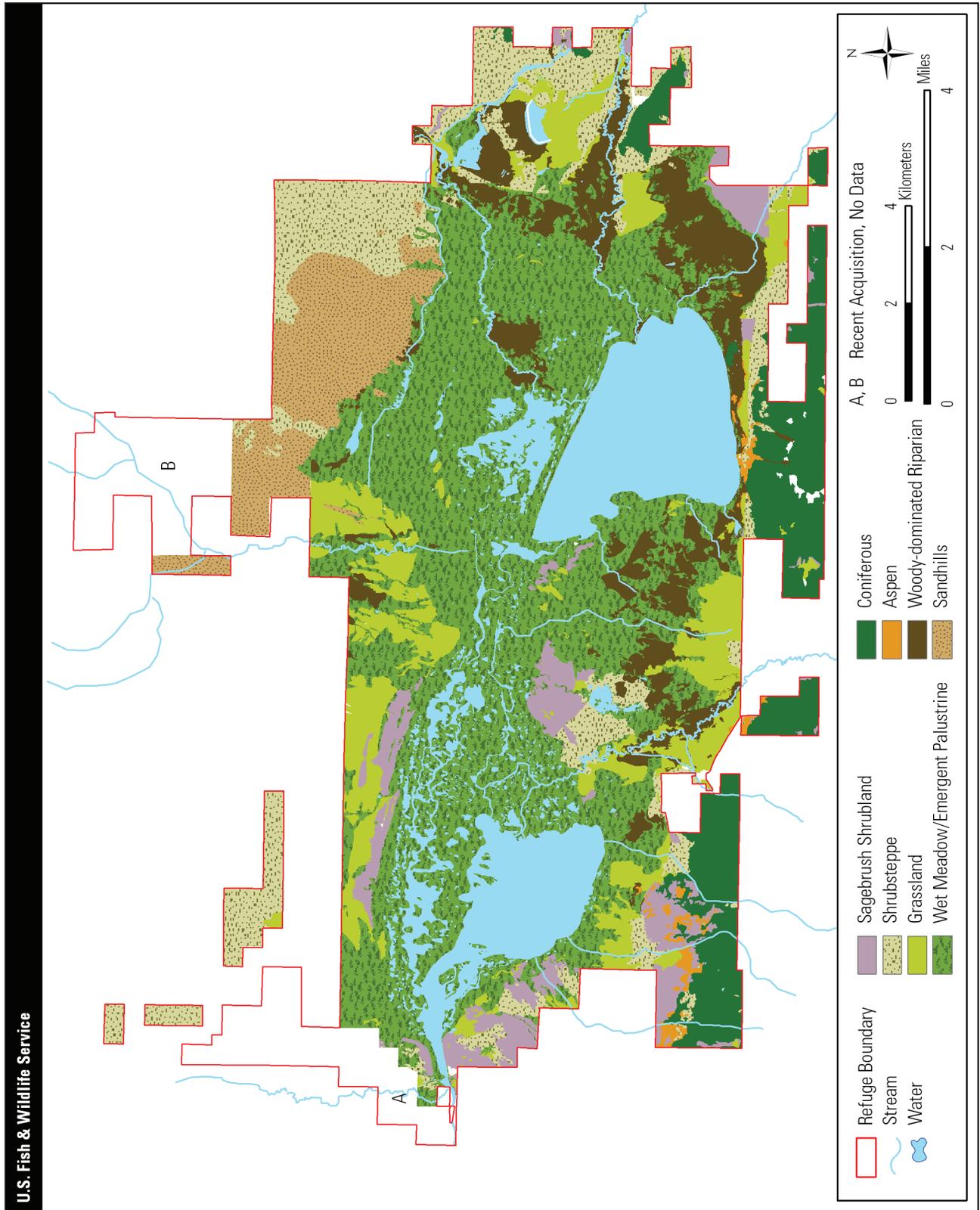


Figure 10. Habitat types found in Red Rock Lakes National Wildlife Refuge.

The most abundant SAV species in refuge lacustrine habitats, in order of decreasing magnitude, are Richardson's pondweed, sago pondweed, and shortspike watermilfoil (Paullin 1973); however, the abundance of SAV species is highly variable. For example, the abundance of shortspike watermilfoil in Lower Red Rock Lake has varied in abundance from <2% of species composition in 1955–56 (Beed 1957) to nearly 60% in 2002 (USFWS 2004). Canadian waterweed comprised nearly 40% of the SAV community in Lower Red Rock Lake during 1955–56 (Beed 1957) but was reduced to trace amounts by 2002 (USFWS 2004). Confounding the shifts in Lower Red Rock Lake SAV communities are the series of water control structures built at the lake's outflow beginning in 1930.

Although many factors determine the distribution of plant species within lacustrine habitats, water depth is perhaps the most significant. Water depths of refuge lacustrine habitats typically do not exceed 7 feet, with the exception of Widgeon Pond. At the greatest water depths experienced on the refuge, SAV may be sparse, especially in more turbid waters. SAV species that can be found at depths >2.5 feet include whitestem, flatstem, and sheathed pondweeds, Canadian waterweed, coon's tail, and star duckweed. At shallower water depths (<2.5 feet), sago, pondweeds (Richardson's, Fries', small, and fineleaf), shortspike watermilfoil, common stonewort, longbeak buttercup, quillworts, wapato, and slender naiad are common. Emergent vegetation in refuge lacustrine habitats is dominated by hardstem bulrush islands within Lower Red Rock Lake (more than 60 acres). Beaked sedge and broadleaf cattail can also be found on these islands. Within Swan Lake and River Marsh, islands of beaked sedge are prevalent. Rush, spike rush, American sloughgrass, smartweed, and common mare's-tail commonly germinate on exposed mud flats during low-water years.

Characteristic Wildlife

Native fishes found in lacustrine habitats include Arctic grayling, mountain whitefish, Westslope cutthroat trout, burbot, white sucker, longnose sucker, and mottled sculpin. Of these species, Arctic grayling and Westslope cutthroat trout have been listed as species of concern by the state of Montana. However, Westslope cutthroat trout in Upper Red Rock Lake are primarily hybrids with Yellowstone cutthroat trout and rainbow trout (Mogen 1996). Nonnative fishes introduced to refuge lacustrine habitats include Yellowstone cutthroat trout, rainbow trout, and brook trout. Yellowstone cutthroat trout are considered a species of concern by the state of Montana within its native habitat, primarily the Yellowstone River and tributaries.

Waterbird species use lacustrine habitats on the refuge primarily for foraging, with the exception of nesting that occurs within the bulrush islands

of Lower Red Rock Lake. Species nesting in these islands include trumpeter swan, canvasback, redhead, lesser scaup, coot, grebes (pied-billed, western, Clark's, red-necked, eared, and horned), Franklin's gull, Forster's tern, white-faced ibis, double-crested cormorant, and great blue and black-crowned night-herons. Marsh wrens and yellow-headed blackbirds are also common nesters on the bulrush islands. American white pelicans are commonly seen on the refuge, although no breeding colony exists.

Mammals common to lacustrine habitats include muskrat, mink, and river otter. Additionally, little brown bats commonly forage over lacustrine habitats at night. Blotched tiger salamander is the primary amphibian of these habitats.

SEASONALLY FLOODED WETLANDS

Seasonally flooded (palustrine) emergent wetlands are typically flooded each spring and dominated by persistent emergent vegetation (plants which grow underwater but have their tops above water), often on peat-forming soils. The frequency and duration of flooding is highly variable and a major determinant of vegetation communities in this dynamic habitat. Soil characteristics (physical and chemical) are also important. More than 9,000 acres of the refuge are palustrine emergent wetlands (USFWS 1999a).

Relatively homogenous stands of beaked sedge represent over 80% of palustrine emergent wetlands on the refuge. These extensive areas of seasonally flooded sedge are largely associated with Upper Red Rock, Lower Red Rock and Swan lakes, and River Marsh. Moving upslope, much of the sedge-dominated habitat is surrounded by the second most common palustrine emergent wetland vegetation on the refuge, Baltic rush. As noted for lacustrine habitats, other emergent vegetation species often germinate on exposed mud flats during low-water years. These include spike rush, American sloughgrass, smartweed, and common mare's-tail.

Characteristic Wildlife

Palustrine emergent wetlands provide extensive habitat for breeding migratory waterbirds. Species known to nest in this habitat include trumpeter swan, canvasback, redhead, lesser scaup, ruddy duck, mallard, northern shoveler, blue-winged and cinnamon teal, gadwall, northern pintail, coot, sandhill crane, Wilson's snipe, sora, Virginia rail, American avocet, marsh wren, and northern harrier. Other birds common to palustrine habitats, but which typically nest in drier areas, include willet, Wilson's phalarope, spotted sandpiper, and killdeer.

Mammal species common to palustrine emergent habitats on the refuge include meadow and montane voles, muskrat, and mink. Striped skunk, coyote, and

U.S. Fish & Wildlife Service

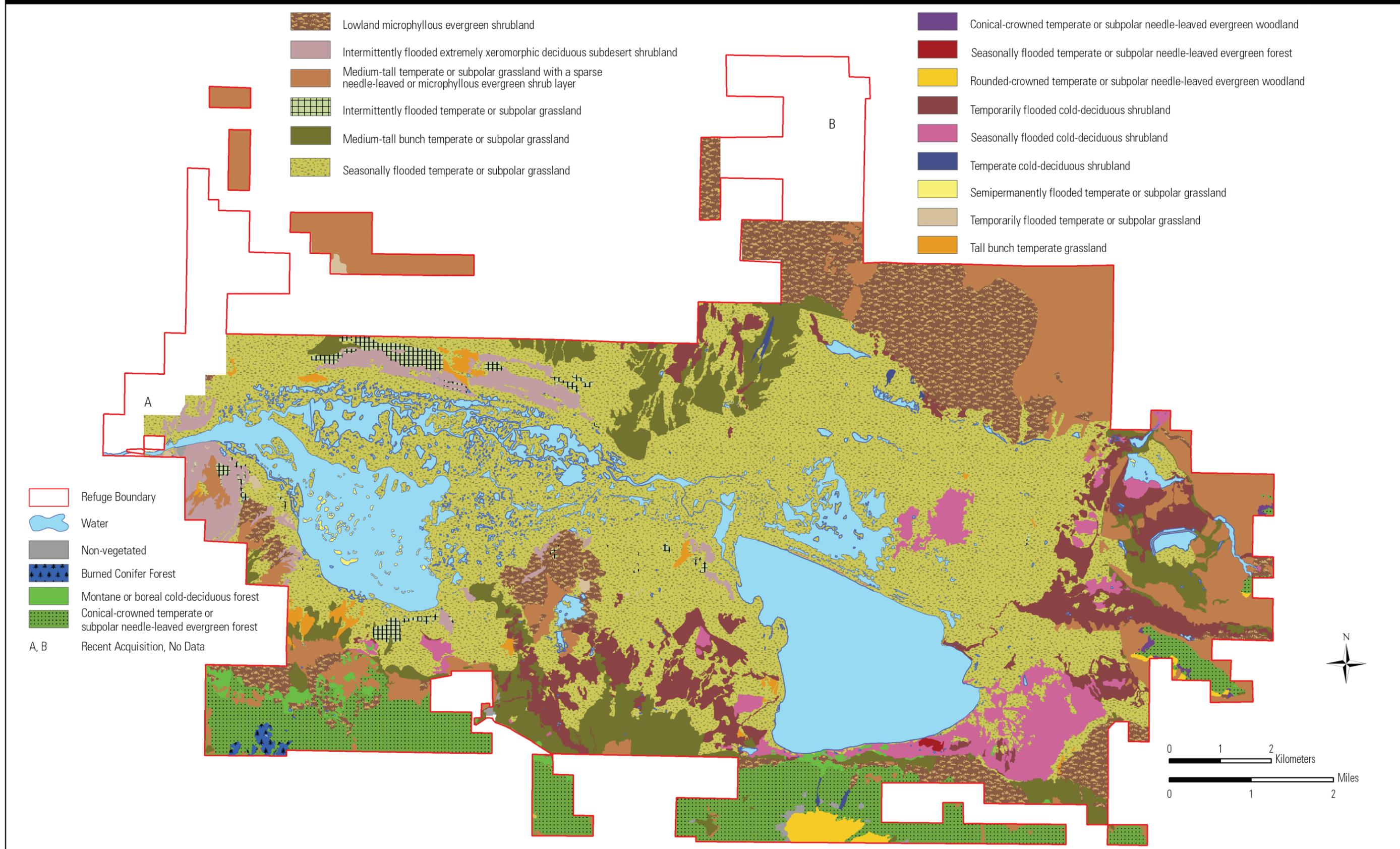


Figure 11. Vegetation classifications found in Red Rock Lakes National Wildlife Refuge.

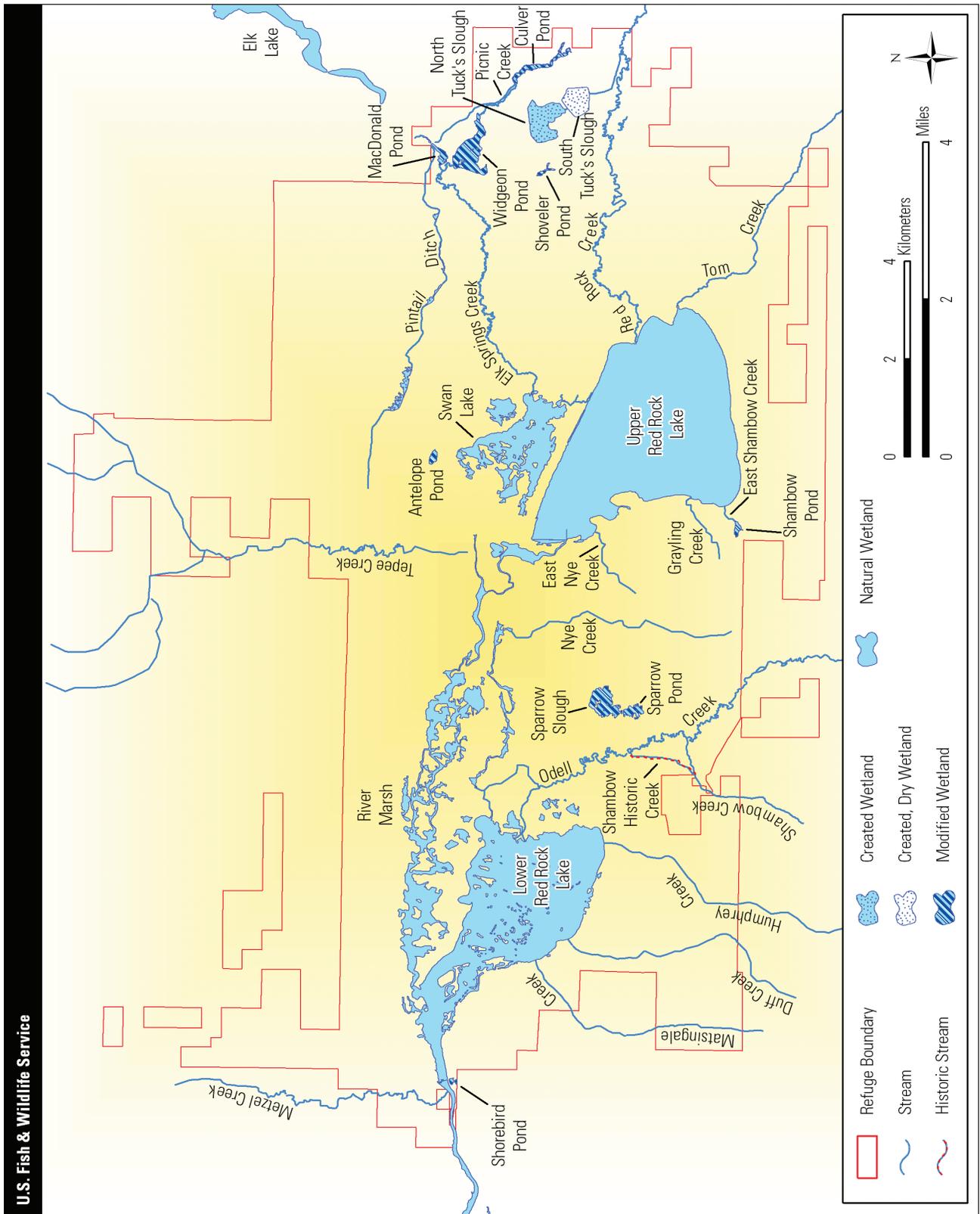


Figure 12. Wetland types found in Red Rock Lakes National Wildlife Refuge.

red fox also commonly forage in these habitats. These habitats also support all of the amphibian and reptile species that occur on the refuge: western toad, boreal chorus and Columbia spotted frogs; blotched tiger salamander; and western terrestrial garter snake.

SHRUB-DOMINATED WETLANDS

Soils in these habitats range from poorly drained peat or muck meadows, saline (salty) to calcareous (containing accumulations of calcium and magnesium carbonate). The refuge has three major wetland shrub communities: shrubby cinquefoil dominated, low-statured willow dominated, and tall-statured willow dominated.

Shrubby Cinquefoil

The shrubby cinquefoil community is dominated by this low-statured (<2 feet in height) shrub with low to moderate (10%–60%) canopy cover. Topography in these wetlands is often hummocky (small scattered knolls or mounds). The surface is saturated through early summer, but the water table typically drops by mid- to late summer. Dominant graminoids (grass and grass-like plants) include Baltic rush, tufted hairgrass, clustered field sedge, and mat muhly. Forbs (broad-leaved herbaceous plants) are diverse and may be abundant with up to 35% cover. Common forb species include meadow zizia, weak groundsel, pleated gentian, meadow thistle, and wild chives. Dandelion, Rocky Mountain iris, and Kentucky bluegrass may be common to abundant in stands that have been heavily impacted by grazing.

Low-statured Willow

Low-statured willow habitats on the refuge are dominated by the low (<3 feet in height) Wolf's willow. Willow canopy cover is typically moderate to high (30%–80%). Soils are generally histosols, entisols, or mollisols (Hansen et al. 1995). This habitat occurs on both subirrigated (created by an elevated water table) flats and adjacent to low-gradient streams. Generally, this habitat remains saturated until late summer. Other shrubs present include bog birch and diamondleaf willow. The understory is a dense graminoid layer dominated by beaked sedge, Baltic rush, and tufted hairgrass. Forb cover is low and slender cinquefoil, northern bedstraw, and largeleaf avens are common.

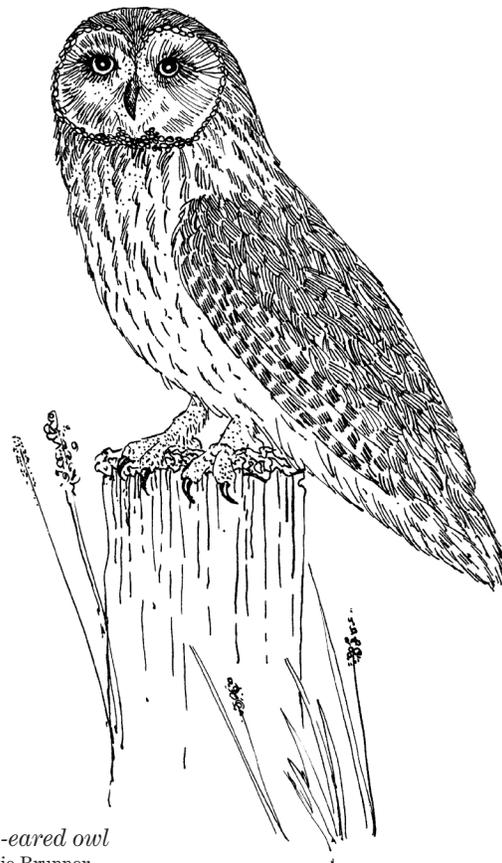
Tall-statured Willow

Tall-statured willow habitats are dominated by Booth's and Geyer willows, with Booth's willow having higher canopy cover. Total willow canopy cover ranges from 10%–30%. On the refuge, these habitats are found along streams as well as in an extensive willow fen (an area of low, flat, marshy land) in the southeastern portion of the refuge. Along streams, soils are generally from alluvium, whereas willow fen soils are derived from peat. These sites

generally remain saturated throughout the growing season. The understory is dominated by graminoids, typically tufted hairgrass, northern reedgrass, and various sedge species. Forbs are diverse but often have low canopy cover (10%–20%). Common forb species include largeleaf avens, wild chives, fringed willow herb, slender cinquefoil, elephanthead lousewort, and false lily of the valley. In all three shrub-dominated habitats, disturbed areas typically also have smooth brome, Kentucky bluegrass, and Canada thistle.

Characteristic Wildlife

Shrub-dominated wetlands on the refuge support a diverse breeding bird community. According to refuge surveys, the most common species include yellow warbler, song sparrow, common yellowthroat, white-crowned and Lincoln's sparrows. Common mammal species include moose, elk, white-tailed deer, striped skunk, meadow and montane voles, and long-tailed weasel. Amphibian and reptile species observed include western terrestrial garter snake, western toad, boreal chorus and Columbia spotted frogs, and blotched tiger salamander. Native fishes found in refuge creeks include Arctic grayling, Westslope cutthroat trout, mountain whitefish, white sucker, longnose sucker, and mottled sculpin. Nonnative fishes include brook trout, rainbow trout, and Yellowstone cutthroat trout.



Short-eared owl
© Cindie Brunner

WET MEADOWS

Wet meadow habitat occurs over 7,000 acres of the refuge. Topography of wet meadows on the refuge varies from level to undulating or hummocky. Soils are poorly drained loam, sandy loam, or clay. These habitats are dominated by a dense layer of graminoids (sedges, rushes, and grasses) with low to moderate forb diversity and low forb canopy cover. These areas are flooded early in the growing season, but soils are dry by mid-summer. Dominant graminoids include Baltic rush, clustered field sedge, and mat muhly. Tufted hairgrass is common on areas with moderate moisture, whereas basin wildrye, Sandberg bluegrass, and meadow and foxtail barley are common on drier or more alkaline sites. Forb coverage and diversity varies with moisture gradient and level of disturbance, mainly grazing. Native forbs in portions of this habitat with moderate moisture include northern bedstraw, darkthroat shooting star, pleated gentian, meadow zizia, meadow thistle, slender thelypody, hooded lady's tresses, weak groundsel, and hookedspur violet. Rocky Mountain iris, common dandelion, and Kentucky bluegrass are common in areas influenced by grazing. Bare ground is rare. The amount of residual cover is variable depending upon the species composition and subsequent vegetative growth of the previous growing season. Differences in species composition and moisture gradients result in a mosaic of relatively short (<1 foot in height) and relatively tall (>2 feet in height) vegetation. On average, vegetation is <20 inches in height by late summer.

Montane wet meadows, a type of high-elevation wetland, undergo a rapid wet/dry cycle, with complete flooding in the spring and early summer followed by two to three months of little to no precipitation. Groundwater flow, surface runoff, and spring/early summer precipitation are important water sources for these habitats (Windell et al. 1986). Hydrologic cycles in these habitats are strongly influenced by snowpack, and water table levels can undergo extreme fluctuations both within a single growing season and annually (Svejcar and Riegel 1998). Variation in the depth to water table has a strong influence on plant species distribution (Allen-Diaz 1991, Castelli et al. 2000, Dwire et al. 2006). Soil characteristics are also important drivers of plant species composition and distribution, in particular the soil redox potential (Dwire et al. 2006). Soil redox potential is the ability of the soil to gain or lose electrons. When soils are inundated with water, pore spaces in the soil are depleted of oxygen, and an anaerobic soil layer develops. The soil redox potential varies temporally and spatially and is strongly tied to water table depth (Castelli et al. 2000). The composition and distribution of plant species reflects, in part, their tolerance of these anaerobic conditions.

The majority of wet meadow habitats on the refuge are grazed by cattle 1 out of every 3 years. Cattle typically arrive in mid-July and remain until mid- to

late September. Nonnative plants, including smooth brome, Canada thistle, and Kentucky bluegrass, have invaded portions of this habitat, particularly areas that were historically-hayed. Prescribed fire has been used to reduce cover of smooth brome.

Characteristic Wildlife

Wet meadow habitats on the refuge support a diverse breeding bird community, including long-billed curlew, willet, sandhill crane, northern harrier, short-eared owl, Savannah sparrow, and western meadowlark. Common mammal species include pronghorn, coyote, striped skunk, meadow and montane voles, long-tailed weasel, and American badger. Amphibian and reptile species observed include western toad, boreal chorus and Columbia spotted frogs, blotched tiger salamander, and western terrestrial garter snake.



Mike Parker/USFWS

Garter snakes are the only reptiles known to inhabit the refuge.

SHRUB-STEPPE AND GRASSLANDS

Upland shrub-steppe habitats, or habitats where both shrubs and grasses share dominance, occur on over 9,200 acres of the refuge. Several shrub-steppe habitats occur on the refuge, with areas dominated by threetip sagebrush. These habitats typically have <20% sagebrush canopy cover. Threetip sagebrush is very localized in Montana, occurring only in the extreme southwestern portion of the state. This species typically occurs on gentle alluvial slopes or benches with moderately deep soils (Mueggler and Stewart 1980). Other common species include green rabbitbrush, fringed sagewort, and spineless horsebrush. Bunchgrasses dominate the understory with an average of 70% cover. Idaho fescue, needle and thread, and prairie Junegrass are the most common bunchgrass species. Typically, <10% of the soil is bare. Forb cover and diversity are low with silvery lupine, spiny phlox, sticky geranium, rosy pussytoes, old man's whiskers, and common yarrow being the most common. Mountain big sagebrush shrublands occur on the southern edge of the refuge on the foothills of the Centennial Mountains, as well as within snowmelt drainages and north-facing

aspects. Again, grasses are the most common plant form in the understory with Idaho fescue, basin wildrye, western needlegrass, and nodding brome being the most common. Forb coverage and diversity are moderate with sticky geranium, flax, and slender cinquefoil being common. Basin big sagebrush shrublands occur only within the Centennial Sandhills (see “Centennial Sandhills” in the next section). Two shrub-steppe habitats, mountain silver sagebrush and greasewood, are considered wetland habitats. Silver sagebrush shrublands occur on alluvial fans on the refuge and typically have <20% sagebrush canopy cover. An alluvial fan is a sedimentary deposit where a fast-flowing stream has flown into a flatter plain. Idaho fescue, basin wildrye, and western wheatgrass are the dominant understory species. Greasewood shrublands also occupy alluvial fans on saline or alkaline soils. Most examples occur on the north and south sides of Lower Red Rock Lake. Grasses dominate the understory and include basin wildrye, western wheatgrass, Nuttall’s alkaligrass, inland saltgrass, and Sandberg bluegrass.

Grasslands on the refuge occur primarily north of Lower Red Rock Lake and make up over 2,000 acres. The bunchgrass, Idaho fescue, has by far the most coverage at over 1,500 acres. On more alkaline soils, basin wildrye, Nuttall’s alkaligrass, and Sandberg bluegrass are common. Forb coverage and diversity is variable depending upon soil moisture and type. Silvery lupine, rosy pussytoes, and common yarrow are the most widely occurring forbs.

Soil type is the primary determinant of vegetation distribution. Secondarily, fire and herbivory are important drivers of sagebrush and grassland structure, composition, and seral stage. High-intensity fires can result in replacement of sagebrush species by subdominant shrubs such as green rabbitbrush, rubber rabbitbrush, and spineless horsebrush. With heavy grazing by livestock during the growing season, native bunchgrasses associated with Idaho fescue-dominated grasslands can be reduced or replaced by nonnative rhizomatous grasses such as smooth brome and Kentucky bluegrass. Rhizomatous plants have underground horizontal stems which send up shoots from underground.

Grassland and shrub-steppe communities on the refuge are relatively intact and contiguous. The largest disturbance to these habitats resulted from seeding of nonnative forage for hay production, which occurred before refuge ownership. These haying operations resulted in the replacement of native vegetation with nonnative, rhizomatous grasses, particularly smooth brome, Kentucky bluegrass, and meadow foxtail. Other invasive species, including cheatgrass, Canada thistle, and common tansy, occur in localized patches throughout these communities.

Characteristic Wildlife

Grassland and shrub-steppe habitats provide important nesting habitat for numerous migratory land birds, waterbirds, and raptors. These habitats also provide critical calving and fawning grounds for native ungulates and support a relatively intact predator and prey community. The value of these habitats to wildlife is enhanced by their relatively unfragmented character. Common birds of shrub-steppe and grassland habitats include Brewer’s sparrow, vesper sparrow, western meadowlark, Savannah sparrow, long-billed curlew, greater sage-grouse, and short-eared owl. Mammal species occurring in this habitat include white-tailed jackrabbit, coyote, badger, red fox, pronghorn, elk, mule deer, and Wyoming ground squirrel. Gray wolves have also been observed in these habitats. Amphibian and reptile species include western terrestrial garter snake, blotched tiger salamander, and boreal chorus frog.

CENTENNIAL SANDHILLS

The Centennial Sandhills (sandhills) cover the northeastern portion of the Centennial Valley and make up over 3,500 acres of refuge habitat. This is 44% of the 7,907 total acres that occur in the valley. These well-vegetated, relatively stable sand dunes are in various states of activity. The western dunes, located outside of the refuge boundary, are the most active and topographically varied, whereas those on refuge lands to the east are well stabilized with less topographic relief. Soils in the sandhills are highly erodible, well-drained, and sandy. Vegetative communities in these sandhills occur nowhere else in Montana (Lesica and Cooper 1999). Basin big sagebrush is the dominant shrub with 5%–40% canopy cover. Such dominance of basin big sagebrush is rare in Montana (Morris et al. 1976). Threetip sagebrush, rubber rabbitbrush, green rabbitbrush, and spineless horsebrush are other common shrubs. Bunchgrass canopy cover ranges from 5%–90% with needle and thread dominant and Idaho fescue codominant in some portions. Other common grasses include prairie Junegrass, Sandberg’s bluegrass, and thickspike wheatgrass. Forbs have 5%–45% cover and moderate to high diversity. Hoary tansyaster, silvery lupine, granite prickly phlox, buckwheat, silverleaf phacelia, tarragon, slimflower scurfpea, and brittle pricklypear are common. 10%–70% of the soil surface is bare sand, although the nonnative pale madwort is common in some portions of the sandhills, subsequently reducing the amount of bare sand. Several rare plant species are found in areas of open sand in early seral portions of this habitat. Two species are critically imperiled (painted milkvetch and sand wildrye), and one species (Fendler cat’s-eye) is imperiled in Montana due to limited range and habitat in the state. The status of a fourth species, pale evening primrose, is currently under review by the network of Natural Heritage Programs.

The sandhills contain several unique vegetation associations, one of which, the threetip sagebrush and needle and thread grass vegetation association, is critically imperiled globally (MTNHP 2002).

Characteristic Wildlife

The Centennial Sandhills support several sagebrush obligate breeding birds, including Brewer's sparrow and sage thrasher. They require sagebrush to survive. Greater sage-grouse use the sandhills from early spring through fall; early refuge records show how grouse migrated to lower elevations for winter, including the western Centennial Valley and Camas Flats in Idaho. Other common breeding species include vesper sparrow, western meadowlark, long-billed curlew, and willet. Mammal species observed in the sandhills include four mammal species of concern in Montana: Preble's shrew, black-tailed jackrabbit, pygmy rabbit, and Great Basin pocket mouse (Hendricks and Roedel 2001). Other common mammals include white-tailed jackrabbit, coyote, badger, red fox, pronghorn, elk, mule deer, Wyoming ground squirrel, northern pocket gopher, and several shrew species. Gray wolf has also been observed in this habitat. Amphibian and reptile species observed in the sandhills include western terrestrial garter snake, blotched tiger salamander, and boreal chorus frog. Several invertebrate species have been observed in the sandhills, including four species of tiger beetle and several butterfly species including Rocky Mountain parnassian, sooty hairstreak, and the common branded skipper (Hendricks and Roedel 2001).



Mike Parker/USFWS

There is minimal aspen habitat within the refuge boundary.

ASPEN WOODLANDS AND FORESTS

Aspen communities comprise approximately 280 acres on the refuge and occur as relatively small patches located within wetlands in the southeastern portion of the refuge near Upper Red Rock Lake, within mixed stands of aspen and conifer, and as larger patches on the fringe of Douglas-fir forests on the southern edge of the refuge. These larger patches are typically associated with old earthflows and landslides on the northern flank of the Centennial Range. The vegetation in these communities is variable, ranging from two-layered quaking aspen overstory and grassland understory communities (quaking aspen and mountain brome, quaking aspen and pinegrass) to multilayered quaking aspen and tall forb; and quaking aspen and tall willow vegetation associations. The upper elevation limit for aspen within the Centennial Valley is about 8,500 feet.

Reproduction in these aspen communities is most likely vegetative via root suckering, forming clonal (genetically identical) stands. Aspen are shade intolerant and regeneration cannot occur under a dense tree canopy (Jones and Debyle 1985). Historically, many of these stands were maintained through disturbances, such as fire, that removed the overstory and promoted root suckering. Large-scale declines of aspen across the western United States have been widely distributed, likely caused by a combination of factors, including global climate change, high levels of ungulate herbivory, and conifer encroachment due to fire suppression (Brown et al. 2006).

Recent work suggests that aspen loss at the scale of the Greater Yellowstone Ecosystem has averaged 10% in the last 50 years—much less than previous studies have suggested (Brown et al. 2006). Much local variability exists in changes in aspen extent, likely based on biophysical setting and climatic conditions (Brown et al. 2006). In the Centennial Mountains of Idaho, vegetation models show a 75% decline in aspen coverage since the mid-1800s (Gallant et al. 2003). A 45% decline in coverage of aspen, and mixed aspen and conifer stands over the past 50 years was estimated in the Gravelly Mountains of southwestern Montana (Wirth et al. 1996). A recent study conducted on the refuge found successful aspen regeneration throughout the twentieth century along the sagebrush-grassland and forest ecotone (a transition zone between two different plant communities) (Sankey et al. 2006). Preliminary results of a second study conducted in the Centennial Valley show some aspen expansion, but most sites exhibited loss of aspen due to conifer encroachment (Korb et al. 2008). Fire suppression has likely promoted the encroachment of Douglas-fir into aspen stands, potentially reducing their extent. Surveys conducted by The Nature Conservancy (on file at Red Rock Lakes National Wildlife Refuge) showed that where aspen are successfully

regenerating, aspen stems are undergoing moderate to heavy browsing by elk and moose, with few stems growing above browse height.

Characteristic Wildlife

Aspen is often considered a keystone species, and aspen habitats, aside from riparian corridors, are the most biologically diverse habitats in the Rocky Mountains (Dobkin et al. 1995). Several bird species breed in aspen woodlands more than in any other habitat (Dobkin et al. 1995, Finch and Reynolds 1987, Turchi et al. 1995, Winternitz 1980), and some species may be aspen obligates (Finch and Reynolds 1987, Turchi et al. 1995). Aspen habitats are particularly important to cavity-nesting birds such as woodpeckers (Dobkin et al. 1995, Martin et al. 2004). The susceptibility of aspen to fungal heartrot creates ideal conditions for cavity excavation, creating nesting and roosting sites for several bird and mammal species (Dobkin et al. 1995). Bird species that breed in aspen habitats on the refuge include red-naped sapsucker, northern flicker, hairy woodpecker, American three-toed woodpecker, American kestrel, tree swallow, house wren, ruffed grouse, warbling vireo, lazuli bunting, western tanager, and great gray owl. Aspen stands on the refuge also provide valuable browse for native ungulates (moose, elk, and mule deer). Gray wolves have also been observed in these areas. Amphibian and reptile species include western toad, boreal chorus and Columbia spotted frogs, and western terrestrial garter snake.

CONIFEROUS WOODLANDS AND FORESTS

Coniferous woodlands (evergreen trees having <60% canopy cover) and forests (evergreen trees having >60% canopy cover) cover over 3,500 acres on the refuge. The primary natural disturbance in these habitats is fire. Several sawmills operated in the Centennial Valley during the early 1900s, but the extent of logging that occurred in the area that is now part of the refuge is unknown.

At the forest and grassland ecotone, open woodlands dominated by Douglas-fir occur. Understory vegetation is dominated by mountain big and threetip sagebrush, bluebunch wheatgrass, and Idaho fescue. Historically, these woodlands underwent frequent (annually to every few years) low-severity fires, which killed sapling and small-diameter trees and maintained the open tree canopy. Since settlement of the Centennial Valley, fires in these woodlands have been actively suppressed because most homes and other buildings occur in this habitat. Cattle grazing occurs in these woodlands, reducing fine grassy fuels. As a result, tree densities have increased and forests have expanded into the adjacent sagebrush and grassland habitat (Heyerdahl et al. 2006, Korb 2005, Sankey et al. 2006).

Open woodlands (tree canopy cover <60%) of limber pine are found on mostly south- and southwest-facing slopes. The ground is mostly bare and gravelly, and understory vegetation is sparse. Scattered common juniper and bluebunch wheatgrass are the most common understory species although their coverage is typically <10%. Fire is infrequent due to the lack of fuels. Trees in these sites may be several hundred years old (Cooper 1999).

Coniferous forests flank the north-facing slopes of the Centennial Mountains, ranging in elevation from 6,700 to 9,600 feet. Common tree species include Douglas-fir, subalpine fir, lodgepole pine, Engelmann spruce, whitebark pine, and limber pine. Shrubs make up a minor component of the vegetative community with mountain snowberry and common white spiraea. The undergrowth can be sparse depending upon tree canopy cover. The forb understory can be diverse, but no species are particularly common except heartleaf arnica, timber milkvetch, and western showy aster. Western meadowrue, showy aster, northern valerian, and mountain sweet-cicely are common forbs on more mesic (moderately moist) sites. In more open forests, the understory is dominated by graminoids, with Geyer's sedge and pinegrass being most common.

Douglas-fir dominates the tree canopy at elevations up to 8,200 feet. Historically, these areas of relatively mesic, lower-elevation forests experienced mixed-severity fires; supporting both frequent (years to decades) low-severity fires, which typically killed individual or small clumps of small-diameter trees, and infrequent (1 to many centuries), high-severity crown fires, which killed large areas (thousands of acres) of canopy trees (Korb 2005, Schoennagel et al. 2004). Accordingly, the fire systems in these forests are the most complex and least understood of the major fire systems in Rocky Mountain forests. A complex interaction of both fuels and climate affect the frequency, severity, and size of fires under mixed-severity fire systems (Schoennagel et al. 2004). Historic fire suppression efforts in these forests were likely few due to their remoteness; thus, current conditions in these forests are likely to be within their historic range of variability.

Above 7,200 feet, moist, high-elevation forests are dominated by subalpine fir, Engelmann spruce, and lodgepole pine. These forests experience infrequent (1 to many centuries), high-severity, stand-replacing crown fires (Schoennagel et al. 2004), and the thin bark of these tree species make them easily killed by fire. Tree density is high in these forests and tree canopy typically exceeds 70%, thus undergrowth vegetation is sparse and fuels are few.

A small (19 acres) seasonally flooded Engelmann spruce forest exists on the south shore of Upper Red Rock Lake. Soils within this association typically remain wet well into the growing season. Old growth Engelmann spruce dominates the canopy. The

understory is dominated by a moderate cover of field horsetail and a dense layer of moss. Other forbs include arrowleaf ragwort, starry false lily of the valley, and claspleaf twistedstalk. This forest type is rare in southwest Montana.

Characteristic Wildlife

Birds of coniferous forests and woodlands on the refuge include northern goshawk, bald eagle, great-horned owl, dusky grouse, Clark's nutcracker, gray jay, Steller's jay, hairy woodpecker, olive-sided flycatcher, hermit thrush, ruby-crowned kinglet, mountain chickadee, brown creeper, yellow-rumped warbler, dark-eyed junco, western tanager, pine siskin, and Cassin's finch. Mammal species that inhabit coniferous forests on the refuge include elk, mule deer, moose, black bear, grizzly bear, wolverine, mountain lion, lynx, marten, short-tailed weasel, golden-mantled ground squirrel, yellow-bellied marmot, and red tree squirrel. Gray wolves have also been observed in these areas. Amphibians and reptiles of these habitats include western toad, boreal chorus and Columbia spotted frogs, and western terrestrial garter snake.

3.3 CULTURAL RESOURCES

This area is rich in both prehistoric and historical resources. A comprehensive cultural resource inventory has not been completed. Only site-specific inventories for construction projects, such as buildings have been done. The area is rich in cultural resources, and a comprehensive inventory would help the refuge in protecting these sites.

PREHISTORIC RESOURCES

Due to its unique location offering access to wetland and mountain ecotones, Red Rock Lakes National Wildlife Refuge has likely supported native people for the last 12,000 years. The area has abundant natural springs and game along with stone suitable for tool manufacture, including obsidian, ignimbrite, cherts, and Quadrant quartzite. The east-to-west trending valley and low pass over the Continental Divide would also have been a natural travel route. Because of deep winter snow, it is likely that summer use by prehistoric peoples was more common (Taylor 1991).

Little excavation work has been conducted near the refuge so models for understanding the culture of native peoples are not well-developed. Being situated at the Continental Divide, Red Rocks Lakes National Wildlife Refuge borrows from both the Basin Plateau Model and Plains Model. In the Basin Plateau Model, artifacts and other technologies are similar to the region west of the refuge. In the Plains Model, the known cultures are archaeologically similar to those in the region east of the refuge. According to a major survey of federal lands in the Centennial Valley

conducted by BLM, prehistoric people inhabited promontories along the Red Rock River and in the forested timberline along south slopes. Springs at the base of the slopes, near the valley floor, have also been documented to be important locations for prehistoric people.

The valley has several prehistoric sites recorded as part of reviews for federal projects. Artifacts found in the valley are from known time periods including Folsom (10,500 BP), Hannah (3,000 BP), and late Prehistoric period (500 AD to 1800 AD). More archaeological work may reveal information on how past peoples lived in the valley.

HISTORICAL RESOURCES

Osborn Russell, a trapper who visited the area in 1835, noted the presence of the Blackfoot tribe. Russell followed a well-established trail that was known to Lewis and Clark in their 1805 visit to the area north of the Centennial Valley. The trail follows the Blacktail drainage and crosses the Centennial Valley. In 1938 Julian Steward noted the presence of Shoshone in the Centennial Valley although, by this time, it is difficult to discern whether this area was part of their aboriginal homelands (Russell 1965).

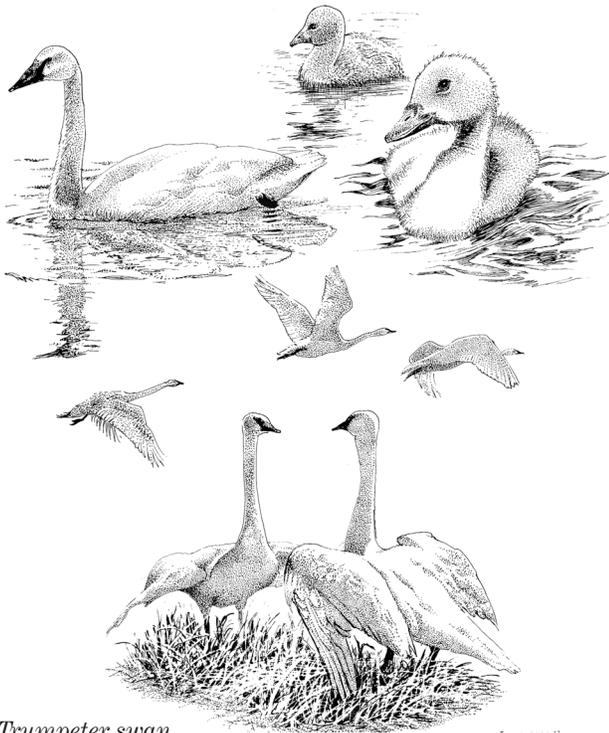
In 1876, in honor of the nation's 100th birthday, the valley was named Centennial Valley by Ms. William Orr (Beaverhead County History Book Association 1990). Reports of abundant waterfowl, fish, game, water, and feed for livestock spurred homesteading efforts. Between 1876 and 1892, development within the refuge went from one cabin to twenty-one ranches and cabins, including a post office, which was the seed for present-day Lakeview. This growth was spurred by the Utah and Northern Railway linking Monida to Idaho and Utah in 1880, and to Butte in 1881 (Ferrel et al. 1981). A stage route linking Monida with West Yellowstone also influenced development, including that at Picnic Springs and Shambow Pond. An article published in August 1902, reported, "the Monida and Yellowstone stage line has carried over 12,000 passengers to Yellowstone National Park this season and are having all they can handle every day" (Beaverhead County History Book Association 1990). Hunting clubs were also established on the shores of Upper and Lower Red Rock lakes.



One of several pre-establishment duck hunting clubs.

Transportation route development elsewhere, drought, long winters, and great distances to market made life difficult in the Centennial Valley. By the Great Depression of the 1930s, few ranchers remained in the valley. Many sold their land back to the Federal Resettlement Administration during the 1930s. The refuge supports several historic homesteads left by the early Anglo settlers including the Shambow, Buck, and Hanson homesteads.

In 1935, the Bureau of Biological Survey (a precursor to the U.S. Fish and Wildlife Service) sent Basyl Kercheval to conduct an evaluation of the area's natural resources in which he suggested these



Trumpeter swan
© Bob Savannah

lands should become a migratory bird refuge. The tremendous natural resources and impacts of unregulated hunting and collecting of waterfowl, especially trumpeter swans, helped spur the establishment of Red Rock Lakes National Wildlife Refuge. He stated, "The economic situation is grave. A large part of the land is mortgaged. Taxes are delinquent in many cases. Livestock in very (*sic*) instance is mortgaged to various agencies for feed. It is conceded by every one that the Red Rock Lakes area has been the foremost breeding, nesting and resting place for migratory waterfowl with the state of Montana" (Kercheval 1935). Soon after, on April 22, 1935, President Franklin D. Roosevelt established Red Rock Lakes Migratory Waterfowl Refuge (renamed Red Rock Lakes National Wildlife Refuge on July 19, 1961).

The refuge was critical in protecting the last known trumpeter swan population in the world. Long before the refuge was established, concern for the trumpeter swan was apparent as noted in a letter to the Dillon Tribune on August 21, 1895; "It is wicked the way the young swan are being caught at the Red Rock Lakes. A man from Lima has made three trips and we are told by good authority he got from 25 to 30 young ones to sell. This ought to be put a stop to or we will soon have none of the sacred birds on our lakes" (Beaverhead County History Book Association 1990).

The Works Progress Administration constructed the original shop/office, barn, residence, oil storage shed, and fire tower from 1936–38. All of the buildings have undergone some modifications with the office undergoing major renovations over the years. Although several other buildings and structures have been added to the headquarters site, it is still considered eligible for inclusion into the National Register of Historic Places.

3.4 SPECIAL MANAGEMENT AREAS

In addition to refuge status, lands may have additional designations which overlay refuge status.

WILDERNESS

Congress designated 32,350 acres of the refuge as Red Rock Lakes Wilderness in 1976 (see figure 13). The wilderness is one of seventy-one such areas managed by the U.S. Fish and Wildlife Service. In 1964, Congress passed and the president signed the Wilderness Act, which established the National Wilderness Preservation System. The legislation set aside certain federal lands as wilderness areas. Four federal agencies of the United States government administer the National Wilderness Preservation System, which includes 702 designated areas and more than 107 million acres. Wilderness, as defined by the Wilderness Act, is untrammeled, undeveloped and natural, and offers outstanding opportunities for solitude and primitive recreation. The Refuge System manages refuge wilderness to secure an enduring resource of wilderness and to accomplish refuge purposes in a way that preserves wilderness character. People value wilderness for its wildlife, scenery, clean air and water, opportunities for solitude, and a sense of connection with nature. Wilderness policy permits hunting, fishing, wildlife observation, wildlife photography, environmental education, interpretation, hiking, backpacking, cross-country skiing, canoeing, and kayaking on national wildlife refuges where these activities are deemed compatible with the purposes of the refuge.

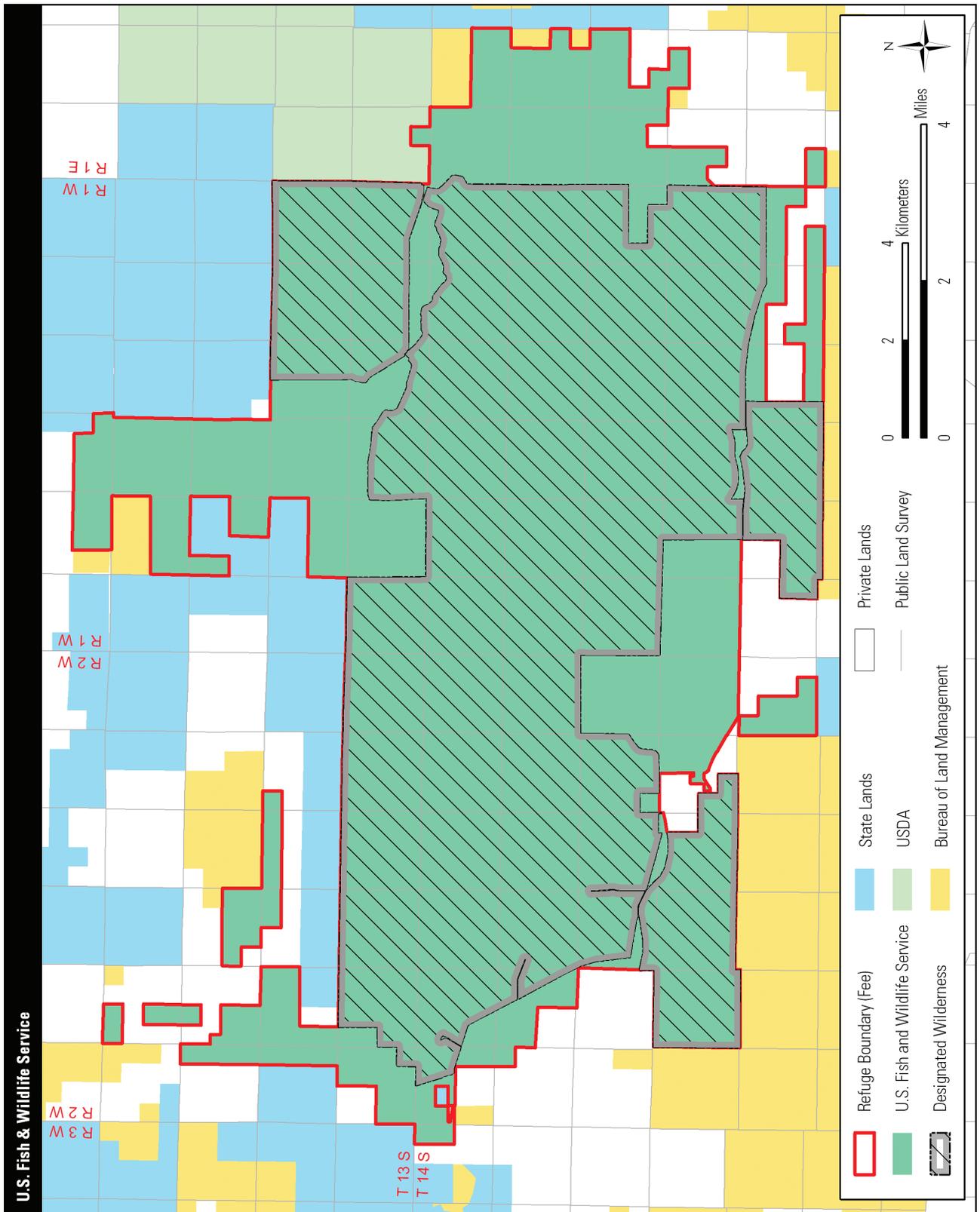


Figure 13. Designated wilderness within the acquisition boundary of Red Rock Lakes National Wildlife Refuge.

WILDERNESS REVIEW

A wilderness review is the process used to determine whether to recommend Service lands or waters to Congress for designation as wilderness. The Service is required to conduct a wilderness review for each refuge as part of the CCP process. Land or waters that meet the minimum criteria for wilderness are identified in a CCP and further evaluated to determine whether they merit recommendation for inclusion in the Wilderness System. To be designated a wilderness area, lands must meet certain criteria as outlined in the Wilderness Act of 1964:

- generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable
- has outstanding opportunities for solitude or primitive and unconfined types of recreation
- has at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition
- may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value

As stated earlier, 32,350 acres of the refuge are already designated as wilderness. This encompasses over 66% of the refuge. The planning team examined other portions of the refuge for inclusion into the wilderness area. Expanding this wilderness area into other portions of the refuge would make management and enhancement of the refuge difficult. This could result in a net loss of habitat and continued spread of invasive plants. The planning team is not recommending any further additions or expansions to this existing wilderness boundary.

NATIONAL NATURAL LANDMARK

The National Natural Landmarks Program was established in 1962 by the Secretary of the Interior “to identify and preserve natural areas that best illustrate the biological and geological character of the United States, enhance the scientific and educational values of preserved areas, strengthen public appreciation of natural history, and foster a greater concern for the conservation of the nation’s natural heritage” (36 CFR 62.1(b)). It is the only natural areas program of national scope that identifies and recognizes the best examples of biological and geological features in both public and private ownership. To date, there are about 600 sites designated as national natural landmarks.

Portions of Red Rock Lakes National Wildlife Refuge were designated as a national natural landmark in May 1976. Designation was granted because the refuge contains a “series of relatively undisturbed, high-altitude ecosystem types, representative of pre-settlement conditions in this region including

various wetland types as well as upland meadows and forests.” The evaluation also commented on the outstanding waterfowl production that occurs on the refuge, as well as the occurrence of several “uncommon species” at the time of designation (some of the uncommon species include peregrine falcon, and bald and golden eagles).

RESEARCH NATURAL AREA

Research natural areas are part of a national network of reserved areas under various ownerships where natural processes are allowed to predominate and which are preserved for the primary purpose of research and education. The U.S. Fish and Wildlife Service administratively designates research natural areas on refuges. Currently, there are 210 research natural areas on national wildlife refuges. Research natural areas have these objectives:

- to help in the preservation of examples of all significant natural ecosystems for comparison with those influenced by people
- to provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment
- to serve as gene pools and preserves for rare and endangered species of plants and animals

On Red Rock Lakes National Wildlife Refuge, the Douglas-fir forest that occurs on Sheep Mountain was designated a research natural area. The entire research natural area is 85 acres in size.

IMPORTANT BIRD AREA

The National Audubon Society’s Important Bird Area Program concentrates on identifying and documenting the top important bird sites throughout all fifty states. For a site to be designated as an Important Bird Area (IBA), it must, during at least



Wilson's phalarope.

some part of the year, contain critical habitat that supports (1) significant numbers of an endangered or threatened species such as piping plover, red-cockaded woodpecker, or Kirtland's warbler; (2) a watch list species such as black rail, cerculean warbler, or Henslow's sparrow; (3) a species with a limited range such as tricolored blackbird, yellow-billed magpie, or brown-capped rosy-finch; or (4) a significantly large concentration of breeding, migrating, or wintering birds, including waterfowl, seabirds, wading birds, raptors, or land birds.

Red Rock Lakes National Wildlife Refuge received designation as an Important Bird Area by the American Bird Conservancy in July 2001. Since that time, the National Audubon Society has assumed responsibility for this program. More than 230 species of birds have been documented on the refuge, which is well known for its breeding trumpeter swans and other wetland species. An estimated 2,000 pairs of Franklin's gulls nest here, as do more than 200 pairs of white-faced ibises. A pair of peregrine falcons and three pairs of bald eagles have nested on the refuge for many years. Thirteen species of breeders (long-billed curlew, olive-sided flycatcher, Cassin's finch, trumpeter swan, bald eagle, northern harrier, Swainson's hawk, peregrine falcon, Wilson's phalarope, short-eared owl, Williamson's sapsucker, red-naped sapsucker, and willow flycatcher) are of global conservation concern. Numerical data are unavailable for most of these species; however, trumpeter swan numbers more than meet requirements for classifications as an IBA.

3.5 PUBLIC USES

Visitors to Red Rock Lakes National Wildlife Refuge enjoy a variety of activities, including priority public uses such as hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Figure 14 shows the location of public use areas at the refuge.

The annual number of visits to the refuge is around 12,000. This estimate is loosely based on visitors entering the visitor contact station, campground sign-in sheets, and general observation. The small visitor contact station, housed with administrative offices, is open Monday through Friday. Information, regulations, and universally accessible restrooms are available.

The refuge has a general brochure that contains a refuge map, describes the refuge and its management, identifies habitats and common wildlife, lists recreational activities, and cites regulations. Two other leaflets provide information for visitors who are hunting or observing birds. These two leaflets are produced by the refuge and do not meet Service graphic standards. Brochures are generally available at the visitor contact station, Upper Lake and River Marsh campgrounds, and at kiosks located

at headquarters, the eastern side of the refuge, and on Elk Lake Road.

HUNTING

Various forms of hunting are allowed in selected units of the refuge. Hunting seasons can start as early as August for archery seasons and generally go through the end of November. Species hunted include elk, white-tailed deer, mule deer, moose, pronghorn, ducks, coots, and geese. Certain areas are closed to hunting to provide resting and feeding habitat for migratory birds, to protect refuge facilities, and to separate user groups. The limited moose hunting (currently an average of eleven permits annually) on the refuge is confined to the willow fen area (southeastern corner of the refuge) and begins later than the state regulations. Boat launches are provided on Lower Lake for waterfowl hunters.

FISHING

Fishing primarily focuses on three introduced trout species (rainbow, brook, and Yellowstone cutthroat). Native sport fish species include Arctic grayling, mountain whitefish, and Westslope cutthroat trout, although the latter has hybridized with the introduced Yellowstone cutthroat. The Arctic grayling and Westslope cutthroat are both species of special management concern. Fishing generally follows state regulations, with some areas closed to fishing seasonally or year-round. Fishing is allowed on Red Rock, Odell, and Elk Springs creeks, and Culver, MacDonald, and Widgeon ponds.

WILDLIFE OBSERVATION AND PHOTOGRAPHY

Wildlife observation and photography is the most popular public use on the refuge. Most visitors view wildlife from the public roads and refuge campgrounds. There are two designated hiking trails, but no auto tour route or overlook. Foot travel is permitted throughout the refuge, except at Shanbow Pond which is closed to the public all year. Visitors are encouraged to take a hike into the wilderness.



Upper Lake campground.

Boat launches are provided at Upper Lake and River Marsh campgrounds, and Lower Red Rock Lake, to allow visitors to explore the refuge and the wildlife by canoe or kayak during certain times of the year.

ENVIRONMENTAL EDUCATION, OUTREACH, AND INTERPRETATION

Staff-led environmental education, outreach, and interpretation programs are very limited, with refuge staff conducting talks or tours on an “as-requested” basis. Due to the refuge’s distance from local schools (minimum 45 miles, one way) and remote location, there is minimal contact with students in the surrounding communities. Visitors may explore the refuge independently and are provided some interpretation of refuge resources through informative panels in four kiosks located at the headquarters, Upper Lake campground, east entrance, and along Elk Lake Road. There are also displays, interpretive panels, and maps in the visitor contact area in the headquarters office. Interpretive panels are also located at Shambow Pond and the sandhills.

CAMPING

Due to its remote location, the refuge provides two campgrounds for visitors to participate in wildlife-dependent recreational activities on and off the refuge. River Marsh campground is located at Lower Red Rock Lake and the other campground is at Upper Red Rock Lake. Both are primitive sites with toilets, fire rings, and some picnic tables. Water is only available at Upper Lake campground. One campsite at the Upper Lake campground is universally accessible, but the outhouses are not.

3.6 SOCIOECONOMIC ENVIRONMENT

A socioeconomic study prepared by BBC Consulting (2007) is the source for the information in this section.

Red Rock Lakes National Wildlife Refuge is open to the public and offers hunting, fishing, and wildlife observation and photography. These recreational opportunities attract outside visitors and bring in dollars to the community. The refuge primarily draws visitors from nearby Henry’s Lake in Idaho, but some come from Yellowstone National Park to the east. Ancillary visitor activity, such as spending on food, gasoline, and overnight lodging in the local area, provides local businesses with supplemental income and increases the local tax base. Management decisions regarding visitor services, expansion of services, and habitat improvement measures may either increase or decrease visitation to the refuge and thus affect the amount of visitor spending in the local economy.

STUDY AREA

Red Rock Lakes National Wildlife Refuge is located in Beaverhead County in southwestern Montana, near the Idaho border. The study area also includes neighboring Madison and Gallatin counties as well as Fremont County, Idaho, because they are in close proximity to the refuge and could potentially be affected by management decisions. Gallatin County is different than the other counties because it has a much greater population and larger urban centers located farther from the refuge; however, it is included in the study area because the city of West Yellowstone, located in the southern arm of the county near the refuge, serves as a base for overnight accommodation and commercial activity among visitors to the refuge. Fremont County in Idaho is also included because many visitors to the refuge stay in the area surrounding Henry’s Lake and in towns to the south.

POPULATION AND DEMOGRAPHICS

The estimated 2005 population of the four-county study area was almost 106,500. Due to the large urban center of Bozeman and surrounding communities, Gallatin County is by far the most populous county in the region, with a population of 78,200 in 2005; followed by Fremont County, Idaho (12,200); Beaverhead County, Montana (8,800); and Madison County, Montana (7,300). The population of the study area grew by over 26% between 1990 and 2000, from 75,800 to 95,700. The population of Montana grew by 13% from 800,000 to 900,000 over the same period. Future growth rates for the study area and the state overall are expected to follow historical trends.

About 32% of the population in 1990 was between 35 and 64 years old, while that same demographic constituted 37% of the population in 2000. Gallatin County, with a large student population, and Fremont County, Idaho, have younger populations, with a median age of 32 in 2000, compared to a median age of 39 in Beaverhead County, and 43 in Madison County.

EMPLOYMENT

Employment in the four-county study area grew significantly between 2001 and 2005, from 43,000 to 50,800, an increase of 18%. Gallatin County had by far the largest workforce with 42,102 employees, followed by Beaverhead County (3,380); Fremont County, Idaho (2,890); and Madison County (2,390). Estimates from 2005 calculated the unemployment rate for Fremont County at 3.9%, Beaverhead County at 3.4%, Madison County at 3.1%, and Gallatin County at 2.8%. These compare favorably to a statewide unemployment level of 4% in Montana and Idaho.

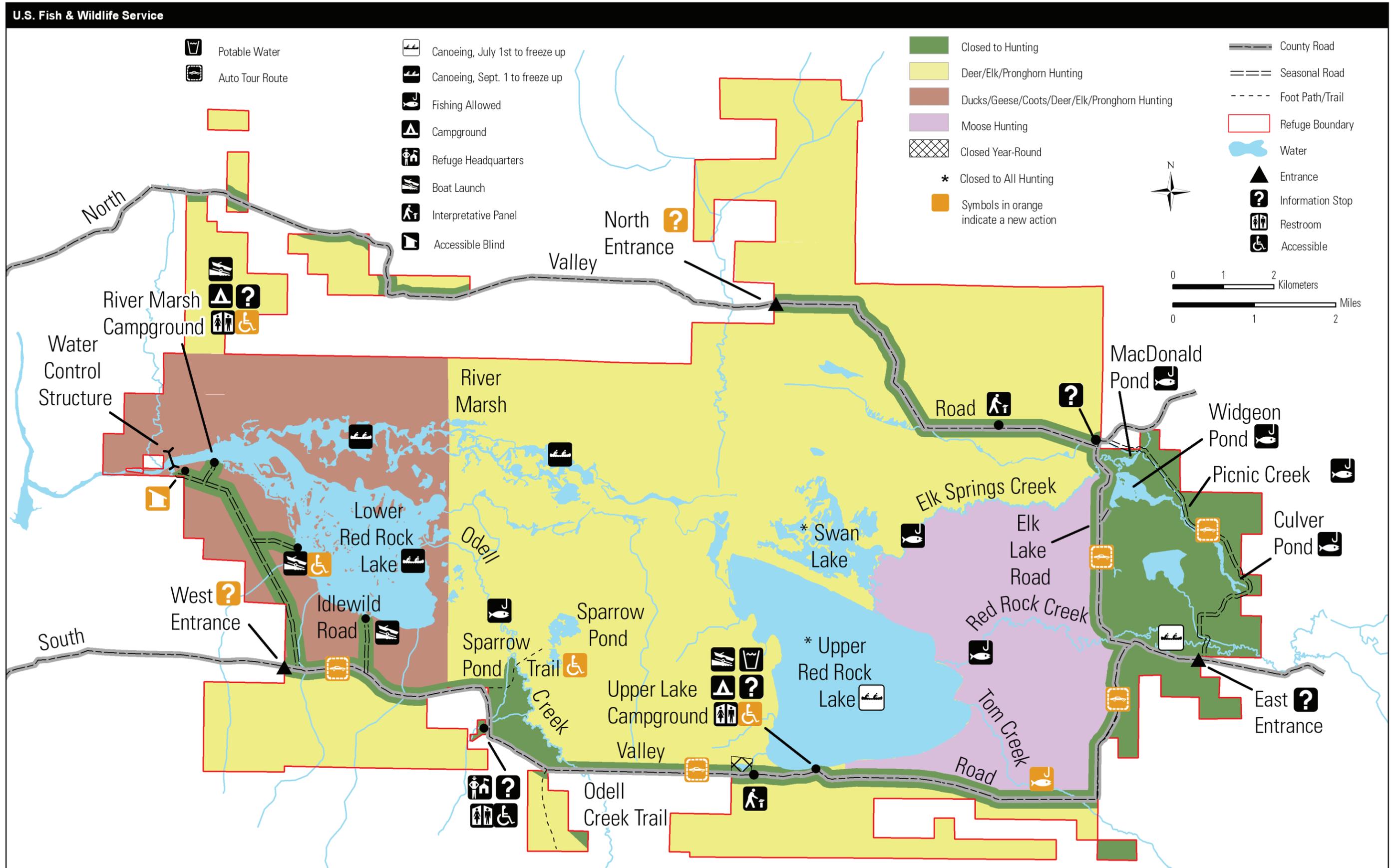


Figure 14. Public use areas to be implemented at Red Rock Lakes National Wildlife Refuge.

The study area primarily employs individuals in retail trade, accommodations and food services, and educational services. Retail establishments employed 15% of the workforce, while accommodation and food services, and educational services each employed 14% of the workforce. The agricultural industry in the study area is small, employing only 2% of the workforce.

These data are largely driven by the large workforce of Gallatin County. When Beaverhead, Madison, and Fremont counties are examined alone, significantly greater proportions of the workforce are employed in agriculture (6.8%) and public administration (13.5%), and a significantly smaller proportion of the workforce is employed in educational services (9.4%).

CURRENT CONDITIONS

Red Rock Lakes National Wildlife Refuge affects the local economy through the visitor spending it generates and the employment it supports. The refuge currently supports five full-time permanent employees.

The refuge sees approximately 12,000 visitor days annually, of which an estimated 85%, or 10,200 visitor days, are not from the local area. Considering that expenditures can vary greatly among campers, lodgers, and passers-by, it is estimated that on average, a visitor to the refuge will spend \$25 in the local area per day, for an annual total of about \$260,000.

3.7 OPERATIONS

This section covers staffing, facilities, and partnerships for the refuge.

STAFFING

Red Rock Lakes National Wildlife Refuge has been managed as a “stand alone” refuge since its establishment in 1935. Over the past 70 years, there have been a wide variety of staffing levels. In fiscal year 2009, the refuge was provided base funding for one full-time permanent refuge manager (GS-13), one full-time permanent assistant refuge manager (GS-11), one full-time permanent biologist (GS-11), one full-time permanent maintenance worker (WG-8), and one full-time permanent administrative assistant (GS-7) (see table 4). In recent years, the refuge has used grants and other “soft” funding sources in order to hire temporary staff (such as seasonal biological technicians) and cover the cost of volunteer services. Over the past 5 years, temporary staffing levels have varied depending on the amount of funding acquired through “soft” funding sources. Temporary staff have been essential for collecting biological data, maintaining equipment and facilities (for example, signs, buildings, and fences), and orienting and educating refuge visitors. The hiring of temporary

staff has been invaluable to accomplishing biological and visitor service goals each year.

Staff located at the refuge headquarters are responsible for Red Rock Lakes National Wildlife Refuge as well as the Centennial Valley Conservation Easement program (see the section “Centennial Valley Conservation Easement” that follows).

Table 4. Current base funded staff at Red Rock Lakes National Wildlife Refuge, Montana, 2009

<i>Staff Group</i>	<i>Position</i>
Management	Refuge manager, GS-13, assistant refuge manager, GS-11
Biology	Wildlife biologist, GS-9/11
Administration	Administrative assistant, GS-7
Maintenance	Maintenance worker, WG-8
Total Salaries and Benefits = \$406,612	

FACILITIES

The refuge used the Works Progress Administration (WPA) between 1936 and 1938 to build one log home, one log administrative and maintenance building (since converted solely to an administrative and visitor contact station), two log storage barns, and one metal fire tower. The refuge has since added several structures to help with management and operation activities. These additional structures include three 3-bedroom residences, one 4-bedroom bunkhouse, one metal maintenance shop, three vehicle and equipment storage structures, one trailer pad, and one 2-bedroom cabin. These structures were obtained through land acquisitions or built by the refuge staff.

The infrastructure for these buildings includes two wells (supplying potable water to the residences, administrative building, bunkhouses, and maintenance shop) and seven operational septic systems. The refuge also has an operable cistern that draws water from Shambow Creek. This was the main source of water for the residences until 1956 when a well was established. The cistern now serves as a back-up water supply system and is used occasionally by the refuge staff. The cistern was also used to supply water to the surrounding town of Lakeview. The current year-round population of Lakeview is between six and nine, including the refuge staff and their families.

There are several unused log buildings and structures that were obtained through various land acquisitions. Several of these serve as reminders of the homesteading era (for example, the Buck and Hanson homesteads), and the Compañeros house

is eligible for listing under the National Historic Preservation Act.

There are numerous water control structures, diversion ditches, culverts, and cattle guards (of various ages and condition) located throughout the refuge. There are approximately 12 miles of public and service roads maintained by the refuge staff and 23 miles of county-maintained roads that bisect the refuge. The South Valley Road (also known as Red Rock Pass Road) is maintained during the winter only from Monida, Montana, to the refuge headquarters. Depending on local weather conditions, this road can be impassable for several days to months at a time during the late fall, winter, and early spring. No other county roads are maintained during the winter months.

CENTENNIAL VALLEY CONSERVATION EASEMENT AND LAND ACQUISITION PROGRAMS

Most valleys and foothills in the greater Yellowstone Area and near the Centennial Valley are being developed or subdivided to provide homes for people wanting to live in more rural settings. During the 1960s, demographers documented that for the first time in American history, higher proportions of people were leaving cities for rural areas than were making the return trip (Fuguitt 1985). “Exurbanization” accelerated in the 1990s, drawing people still further out into the rural West. In the 1990s, the West’s “beachfront property”—rural lands adjacent to national parks and forests—were the fastest growing areas (Rudzitis 1996). In the Greater Yellowstone area, fully one-third of all private lands have already been subdivided for development, with a majority of new lots located outside existing towns (Harting and Glick 1994). In Gallatin County, 17,000 acres of farmland were subdivided between 1993 and 1999. Madison Valley recorded 16,000 acres subdivided into 685 lots between 1994 and 1998—most of this into 20-acre “ranchettes” (Johnson 1999). Even in counties with slow growth rates, loss of agricultural land continues. The state of Montana, as a whole, is consuming land four times faster than the population growth rate (U.S. Census Bureau 1999).

The Centennial Valley, in which the refuge lies, remains biologically intact and has not been converted to housing developments. Almost 150,000 acres in the Centennial Valley are privately owned, and the majority of this land remains as large working ranches. The Service recognized a unique partnership opportunity and in 2001 the Service approved the Centennial Valley Conservation Easement Program. Through this program, willing landowners are compensated for a perpetual easement that keeps their lands from being subdivided and developed, while still permitting them to use their ranch lands and retain their way of life. Since this program began, the refuge has

acquired perpetual conservation easements on 20,342 acres from nine landowners (see figure 6). There are approximately 20,000 acres of additional ranch lands in the Centennial Valley protected by perpetual easements acquired by nongovernmental organizations. Given the current trends of low cattle prices and a strong market for scenic western properties, the remaining unprotected Centennial Valley ranches may be vulnerable to sale and subdivision for development.

To achieve Service goals for fish, wildlife, and habitats (including providing large tracts of unfragmented habitats), the Service will pursue acquisition or protection, or both, of inholdings from willing sellers within the approved refuge and Centennial Valley conservation easement boundaries using both fee title and perpetual conservation easements (USFWS 2001). Key areas to acquire and protect include, but are not limited to

- lands that protect and augment existing large tracts of undeveloped and unfragmented habitats;
- lands that would protect wetland or riparian habitats, or both (such as those along Red Rock Creek);
- lands that would protect source waters into the refuge to maintain or improve water quality and quantity of the refuge’s wetland habitats, such as Alaska Basin and Red Rock Creek. (Note: the reach of Red Rock Creek through the area known as Alaska Basin is the largest input of water into the refuge remaining unprotected. It is key spawning habitat for Arctic grayling and arguably the most important input of water into the refuge’s wetland complex).

Staff located at the refuge headquarters are responsible for Red Rock Lakes National Wildlife Refuge and for managing and monitoring lands protected under the Centennial Valley Conservation Easement program. No additional staff or operational funding was added to the refuge when the conservation easement program was established in 2001.

PARTNERSHIPS

The refuge has a history of fostering partnerships that help the refuge accomplish its mission and goals. The refuge actively sought and fostered partnerships with organizations and individuals with whom a common goal was shared. These partners include county, state, and federal agencies; nongovernmental organizations and conservation groups; schools, colleges, and universities; and local landowners and private citizens. Private lands and significant acres of federal and state lands surround the refuge. These neighboring landowners and agencies have been and will continue to be partners in achieving the refuge’s vision in the Centennial Valley, while sharing ideas and resources.

The refuge's partners have assisted in wildlife and habitat management, visitor services and recreational opportunities, land protection and acquisition, fire protection, law enforcement, and community outreach. Several of these relationships have developed into formalized partnerships with written agreements or memorandums of understanding, while others remain more informal.



Laura King/USFWS

The refuge office, one of several historical structures.

4 Management Direction



Refuge wetland complex.

The Service selected the management direction described in this chapter after determining that it does the following:

- best achieves the refuge's purposes, vision, and goals, and helps fulfill the Refuge System mission
- maintains and, where appropriate, restores the ecological integrity of the refuge and the Refuge System, and addresses the significant issues and mandates
- is consistent with principles of sound fish and wildlife management

This chapter also discusses objectives and strategies that will be implemented to help refuge staff achieve the CCP goals.

4.1 MANAGEMENT FOCUS

- There will be improved management of wetland habitats for trumpeter swans and other waterfowl and wetland birds. Management will focus on maintaining high wetland productivity through infrequent drawdowns of modified and created wetlands to benefit breeding and migrating waterfowl.
- There will be improved management of riparian habitats to benefit migratory birds and Arctic grayling. There will be restoration of some modified wetlands (including Culver and McDonald ponds) back to riparian corridors.
- Management actions (such as prescriptive grazing and prescribed fire) will only occur on the refuge to achieve specific habitat and wildlife objectives, and will include increased and improved oversight, monitoring, and research conducted to assess if management objectives are being met.
- Visitor service programs will be improved to provide a quality visitor experience while promoting an increased awareness and understanding of refuge resources and management programs, which will result in garnering support for the Refuge System and the conservation of Red Rock Lakes National Wildlife Refuge and the Centennial Valley.
- In addition to the current staff of five and the existing facilities, the following will be needed to fully implement this plan:
 - one permanent full-time GS-9 wildlife biologist and at least three temporary biological science technicians
 - one permanent full-time GS-7 range technician
 - one permanent WG-6 seasonal maintenance worker
 - one temporary visitor services specialist
 - one temporary office assistant

- one of the seven permanent staff will be required to carry law enforcement credentials
- Due to expanded refuge programs all grade levels for current staff will be evaluated
- up to four new residences for current and added staff
- three additional concrete pads to accommodate recreational vehicles needed to recruit seasonal volunteers

4.2 GOALS, OBJECTIVES, STRATEGIES, AND RATIONALE

This section discusses goals, objectives, and strategies that serve as the steps needed to achieve the CCP goals.

A *goal* is a descriptive, broad statement of desired future conditions that conveys a purpose but does not define measurable units.

An *objective* is a concise statement that indicates what is to be achieved, the extent of the achievement, who is responsible, and when and where the objective should be achieved.

The *rationale* for each objective provides context, such as background information, assumptions, and technical details.

The *strategies* describe the actions needed to achieve the objectives.

LAKE, POND, AND MARSH HABITAT GOAL

Provide habitat for breeding and staging migratory birds, native fishes, and resident wildlife that maintains the biological diversity and integrity of montane wetland systems.

Target Species for Lake, Pond, and Marsh Habitat

To direct management actions for the greatest benefit of trust species in refuge lake, pond, and marsh habitat, we reviewed several federal, state, and nongovernmental lists to determine birds of conservation concern that use these habitats during breeding and migration. Five migratory bird species were selected as target species: trumpeter swan, lesser scaup, American wigeon, Franklin's gull, and Wilson's phalarope. Managing lake, pond, and marsh habitats for these species will (1) ensure diverse and productive habitats for target species and other native wildlife, (2) support Service conservation priorities and mandates, and (3) support national and regional interagency conservation plans such as the "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans." The target species were selected based on:

- All five species use the refuge for some portion of their breeding cycle.

- Trumpeter swan, lesser scaup, American wigeon, and Wilson's phalarope are Service focal species (USFWS 2005).
- Wilson's phalarope is a bird species of conservation concern (USFWS 2002b).
- Trumpeter swan and Franklin's gull are state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- Trumpeter swan, Franklin's gull, and Wilson's phalarope are listed as priority level III or higher by Montana Partners in Flight (Casey 2000).

Trumpeter Swan Objective

Trumpeter Swan Objective 1: Following objectives put forth by the "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans" (Subcommittee on Rocky Mountain Trumpeter Swans 2008), the refuge will work to ensure there are nineteen nesting pairs and 140 adults and subadult trumpeter swans during the breeding season, on average, in the Centennial Valley by 2013.

Strategies

- Continue seasonal closures of important breeding habitats to minimize disturbance to trumpeter swans and other waterbirds during nesting and brood rearing periods.
- Continue year-round closures of natural lakes to fishing and hunting for the benefit of staging and migrating trumpeter swans and other waterbirds (Swan and Upper Red Rock lakes).
- Continue to manage wetlands using infrequent drawdowns to improve productivity of these habitats for breeding, staging, and migrating trumpeter swans.
- Continue to coordinate the annual fall survey of the tri-state component of the Rocky Mountain population of trumpeter swans.
- Continue to conduct annual nest and brood surveys of the refuge and surrounding Centennial Valley to monitor trumpeter swan production.
- Continue to work with cooperators to address factors affecting key demographic rates of tri-state trumpeter swans, such as adult survival.

Rationale

Trumpeter swans were once abundant across most of North America, but were reduced to a population of less than 120 known individuals by 1936 (Banko 1960). From this population low point, through diligence and hard work by many, trumpeter swans have recovered remarkably. In 2005, there were nearly 35,000 known trumpeter swans in North America, with breeding populations in fifteen states across the native range of the species. The

Rocky Mountain population of trumpeter swans, which includes swans that nest and winter in the Centennial Valley, reached a record high of 5,228 birds in 2005. This population winters in the tri-state area of southwestern Montana, southeastern Idaho, and northwestern Wyoming. The population nests in two general areas. The largely nonmigratory tri-state subpopulation nests primarily in the Centennial Valley of southwestern Montana, Yellowstone National Park, and southeastern Idaho. A migratory population segment, the interior Canada subpopulation, nests in Alberta, British Columbia, Yukon, Northwest Territories, and Saskatchewan.

Red Rock Lakes National Wildlife Refuge played a pivotal role in the contiguous restoration of trumpeter swans, and the Centennial Valley continues to be one of the most productive swan habitats in the tri-state area of Montana, Idaho, and Wyoming. From the inception of the refuge in 1935 to the winter of 1992–93, winter feeding of trumpeter swans occurred on the refuge, with the initial goals of increasing swan production in the surrounding area and improving the refuge's ability to protect the small population from illegal harvest. Winter feeding was one of a suite of actions taken to restore trumpeter swans that included translocation, captive rearing, and intensive field studies to provide a better understanding of swan ecology.

Trumpeter swan management on the refuge is currently focused on providing productive and undisturbed wetland habitats during critical breeding, staging, and migrating periods. This includes a recent change in water level management of Lower Red Rock Lake and River Marsh, which supports more nesting swans than any other habitat on the refuge. Beginning in 1988, after the construction of the existing WCS at the outflow of Lower Lake, water management called for a Lower Lake water level of 6609.0 mean sea level (msl) during early spring. This level results in most residual emergent wetland vegetation being flooded to a level that makes it unavailable to overwater nesting waterfowl. These high water levels were commonly maintained into June and in some years much longer, essentially shifting the ecology of Lower Lake from a highly productive wetland to a less productive shallow lake. Other potential negative effects of high spring water levels on waterfowl during the prebreeding and breeding periods include reduced availability of foodstuffs, including aquatic invertebrates (Murkin and Kadlec 1986) and roots and tubers. High water levels may also delay the onset of submerged aquatic vegetation (SAV) growth by limiting light penetration and causing lower water temperatures, negatively affecting foraging waterfowl. Trumpeter swans may be particularly sensitive to elevated water levels in the early spring. Tubers are an important carbohydrate-rich food source for trumpeter swans, especially during late winter and early spring (Anderson and Low 1976, Paullin 1973, Squires and Anderson 1995). Although

little is known of the nutrient dynamics of breeding trumpeter swans, many temperate breeding waterfowl are dependent upon stored endogenous fat reserves obtained during early spring for clutch formation (Alisauskas and Ankney 1992). Reduced availability of tubers could prevent prebreeding swans from attaining adequate endogenous reserves.

While it is obvious that a population must successfully reproduce to sustain itself, reproductive success, per se, may not be the most significant factor affecting population growth. Reproduction is considered 'costly' to individuals due to the increased mortality risks associated with breeding and caring for young. This results in a trade-off between reproductive effort and adult survival, and suggests that individuals must balance the immediate cost of reproducing in a given year and the probability of future reproductive success. For short-lived bird species this typically results in most, or all, individuals breeding each year regardless of conditions—their chance of surviving to breed again is low, so they have little choice but to breed in an effort to maximize their lifetime reproductive success. They have to put all their proverbial "eggs in one basket." However, in long-lived bird species, individuals are likely to survive for multiple breeding seasons; therefore, they can optimize their lifetime reproductive success by not breeding at all, or abandoning their brood, during poor years, surviving to breed in years where the likelihood of fledging young is greater. For trumpeter swans, which can live greater than 20 years in the wild, maximum fitness can be achieved by foregoing breeding in a poor year, waiting until better conditions are available to attempt nesting and rearing of young. This can result in seemingly extreme variation in annual production in long-lived species in variable environments, like trumpeter swans in the Centennial Valley. It is also believed that this is why population growth is most sensitive to changes in adult survival of long-lived species (Gaillard et al.



Trumpeter swans.

2000, Ricklefs 1977, Schmutz et al. 1997). Given this understanding of how long-lived species have evolved a life-history strategy that maximizes adult survival, it is imperative that trumpeter swan management considers factors affecting key demographic rates like juvenile and adult survival in addition to annual reproductive success.

Natural Lakes Objective

Natural Lakes Objective 1: Maintain Upper Red Rock and Swan lakes in a SAV-dominated stable state (>35% and 60% SAV canopy cover, respectively) throughout the life of the CCP, for the benefit of migratory birds and native fishes.

Strategies

- Review existing water quality data to provide an understanding of the natural variation to be expected in Upper Red Rock and Swan lakes.
- Develop a monitoring protocol with an emphasis on factors that could alter phosphorous and nitrogen levels, as well as turbidity (for example, upland management in the surrounding watershed).

Rationale

Shallow lakes often exist in one of two stable states. The first, and current state of Upper Red Rock and Swan lakes, is a relatively clear water, SAV-dominated condition. The second state is characterized by turbid water and algal domination. These two states seem to fall along a continuum of abiotic and biotic factors such as total phosphorous concentrations (Bayley and Prather 2003) and the presence of zooplankton grazers (Jeppesen et al. 1998), respectively. Several of these factors can be altered by human actions higher in the watershed.

The refuge's natural lakes provide foraging and brood-rearing habitat for a diverse group of waterfowl and waterbirds. Maintaining these lakes in a SAV-dominated condition increases the value of the lakes to foraging birds. Greater plant biomass directly benefits predominantly herbivorous species such as trumpeter swan (Mitchell 1994, Squires and Anderson 1995), as well as increases the abundance and diversity of invertebrates (Krull 1970, Voigts 1976, Zimmer et al. 2000) for breeding ducks (Baldassarre and Bolen 2006) and largely carnivorous species such as eared grebe

(Cullen et al. 1999), Franklin's gull (Burger and Gochfeld 1994), and Wilson's phalarope (Colwell and Jehl 1994).

Upper Red Rock Lake also supports one of the last endemic populations of adfluvial Arctic grayling in the contiguous United States (Kaya 1992, Unthank 1989). This population migrates into Red Rock Creek during the spring to spawn and lives the remainder of the year in Upper Red Rock Lake (Gangloff 1996, Nelson 1954). There is limited evidence that a small component of the population migrates into Odell Creek during the spring to spawn (Gangloff 1996, Nelson 1954), although a recent Service survey indicated most Arctic grayling that spawn in Odell Creek spend the entire year in the creek. Aquatic invertebrates are a significant food source for lake-dwelling Arctic grayling (Kruse 1959, Leonard 1939); therefore, this unique population of Arctic grayling will also benefit from maintaining Upper Red Rock Lake in its current SAV-dominated condition.

Water-quality monitoring will be conducted to ensure the management of adjacent habitats would not adversely affect the lakes. Grazing and fire are known to increase the nutrient cycling of nitrogen and phosphorous (Burke et al. 2005, Hauer and Spencer 1998, McEachern et al. 2000). Management of upland habitats adjacent to Upper Red Rock or Swan lakes could result in elevated levels of these nutrients. Elevated levels of phosphorous and nitrogen can lead to increases in algae and turbidity in shallow lakes, which may ultimately lead to significant losses of SAV communities (Egertson et al. 2004).



Created wetland, North Tuck Slough.

Managed Wetlands Objectives

Managed Wetlands Objective 1: Manage Shambow, Shorebird, Shoveler, Sparrow, and Tepee Creek ponds and Sparrow Slough with alternate, infrequent drawdowns to provide approximately 132 acres of semipermanent palustrine emergent habitat with 30%–50% flooded emergent canopy cover for the benefit of breeding target species and other migratory birds over the life of the CCP.

Managed Wetlands Objective 2: Over the life of the CCP, divert water to North Tuck Slough from Red Rock Creek only in years when snow-water equivalent is above the 30-year average by the last day of snow-pack accumulation, as measured by the SNOTEL site (SNOPack TELemetry), U.S. Department of Agriculture Natural Resources Conservation Service. This will provide 103 acres of semipermanent palustrine emergent habitat with 30%–50% flooded emergent canopy cover for breeding migratory bird habitat, while protecting riparian corridors on Red Rock Creek.

Strategies

- Conduct a drawdown every 7 years (on average), in an alternating cycle, on managed wetlands, throughout the life of the CCP.
- Begin monitoring emergent wetland vegetation to ensure the objective is being met, within the first year of implementation of the CCP.
- Fill North Tuck’s Slough, via the Hansen diversion, as prescribed.
- Throughout the life of the CCP, monitor Red Rock Creek for Arctic grayling fry upstream of the Hansen diversion weekly when diverting water to North Tuck’s Slough. The diversion will be closed when Arctic grayling fry are observed (see Arctic Grayling Objective 1).

Rationale

Periodic drawdowns will be undertaken to increase productivity of these managed wetlands. Maintaining relatively static and high water levels, as has been done with the wetlands in recent history, lowers wetland productivity. Static water levels create anaerobic conditions within wetlands, thereby limiting decomposition and nutrient cycling (Brinson et al. 1981). The natural drought cycle of prairie glacial wetlands allows for infrequent aeration of the bottom substrate and decomposition of accumulated detritus (Mitsch and Gosselink 1986). Less is known about the effects of drought on montane wetlands, but key physical processes (such as decomposition of detritus and release of soluble nutrients) should function in much the same fashion. Therefore, drawdowns in managed wetlands are frequently recommended in order to mimic the natural drought cycle and stimulate the decomposition of accumulated detritus and nutrient cycling (Payne 1992).

Persistent deep water in wetlands also alters plant communities. Many species of wetland plants do not germinate in deep water and cannot survive if continuously flooded (Bishop et al. 1979, Harris and Marshall 1963, Kadlec 1962, Weller 1999). As a result, there are greater open-water areas, which reduces populations of aquatic invertebrates and lowers bird diversity (Weller and Spatcher 1965, Weller 1981). Although this open-water marsh stage is selected by various bird species such as American coot, lesser scaup, ruddy duck (Murkin et al. 1997), and grebes (Cullen et al. 1999, Muller and Storer 1999, Storer and Nuechterlein 1992), it represents a phase of the natural cycle marshes undergo, not a climax community. Drought conditions “reset the clock” for an open-water-stage marsh by lowering water levels, which results in exposed mud flats that stimulate plant germination. When reflooding occurs, dense stands of inundated emergent vegetation persist for a brief period before being flooded out. The period of open water, interspersed with emergent vegetation in roughly equal amounts, is known as the hemi-marsh. Maximum bird numbers and the greatest diversity of dabbling duck species are associated with the hemi-marsh stage (Kaminski and Prince 1981, Murkin et al. 1997, Weller and Spatcher 1965). The continued flooding during the hemi-marsh stage results in the return of the marsh to the open-water stage.

Managed Wetlands Objective 3: Remove impoundments on Elk Springs Creek and the upper reach of Picnic Creek that create MacDonald and Culver ponds, respectively, within 15 years of CCP approval, to restore approximately 1.7 miles of riparian habitat for spawning Arctic grayling, migratory birds, and native ungulates (see Arctic Grayling Objective 1).

Managed Wetlands Objective 4: Throughout the life of the CCP, maintain Widgeon Pond at full pool to maintain the trumpeter swan nesting territory and provide lacustrine habitat for Arctic grayling during nonbreeding periods of their life-cycle.

Managed Wetlands Objective 5: Restore a spawning population of Arctic grayling in Elk Springs and Picnic creeks within 15 years of the plan’s approval (see Arctic Grayling Objective 1).

Strategies

- Conduct drawdowns on Culver and MacDonald ponds during the first 5 years of the plan and monitor trumpeter swan response.
- Until restoration is complete, maintain the current infrastructure on Culver and MacDonald ponds to allow water-level manipulations to (1) establish stream channels, (2) restore native riparian vegetation, and (3) provide the option of flooding out nonnative invasive plants such as Canada thistle.

- Use stream sections below each of the proposed restorations as representative sites (such as width to depth ratio, sinuosity, and riparian vegetation species composition and canopy cover) to determine when restoration has been successfully completed.
- Define Arctic grayling spawning habitat based on cobble size, stream stretch classification (riffle, pool, run), and water temperature and velocity to ensure suitable spawning habitat is provided in each restored stretch.
- Update the WCS at Widgeon Pond to a design that will prevent emigration or immigration of fish.
- Replace the culvert on Culver Road to make fish movement to the headwaters of Elk Springs Creek easier.
- Remove nonnative fish from Picnic Creek and Widgeon Pond, throughout the life of the CCP.
- Use remote-site incubators (Kaeding and Boltz 2004) in Elk Springs and Picnic creeks to reestablish Arctic grayling populations.
- Restore Pintail Ditch. This will also preclude diversion of water to the West Pintail Ditch wetlands. Move the recently installed fish screen on Pintail Ditch to the Hansen Diversion, which is used to fill North Tuck Slough from water diverted from Red Rock Creek.

Rationale

Arctic grayling in Montana represent a glacial relict population from the Wisconsin Ice Age (Redenbach and Taylor 1999). Two endemic Arctic grayling populations are known to persist in Montana: a fluvial (river-dwelling) form in the Big Hole River and an adfluvial (lake-dwelling and stream spawning) form in Upper Red Rock Lake, and two lakes in the Big Hole river drainage. These populations represent the last endemic populations



Mike Parker/USFWS

Moose depend on refuge riparian areas for winter survival.

of adfluvial Arctic grayling in the contiguous United States, although populations have been established in greater than thirty lakes throughout western Montana (MFWP 1996). Adfluvial Arctic grayling spend the nonbreeding season in lake habitats, while using lake tributaries for spring spawning activities.

Early accounts by homesteaders show that Arctic grayling were common throughout the lakes and streams of the upper Centennial Valley (Unthank 1989). The population began to decline in the 1930s (Vincent 1962), likely due to a combination of factors such as introduction of nonnative fish (such as brook trout), water diversion, Lima and Clark Canyon dams that block fish from historic habitat, and heavy grazing of riparian corridors (Unthank 1989). Upper Red Rock Lake Arctic grayling currently only spawn in Red Rock and Odell creeks, although historically they spawned in other Upper Lake tributaries.

Restoring Elk Springs Creek and the upper reach of Picnic Creek will provide approximately 1.7 miles of stream habitat that was traditional spawning habitat for Arctic grayling. To create a lake and creek complex to meet the life-history needs of adfluvial Arctic grayling, Widgeon Pond, an impoundment downstream of Culver Pond on Picnic Creek, will be maintained. The Picnic Creek and Widgeon Pond complex will be managed specifically for Arctic grayling, which will include the removal of nonnative fish. This complex will provide a local Arctic grayling population for other reestablishment projects in the valley. Widgeon Pond is also large and deep enough that it could possibly support a Westslope cutthroat population as part of the pond's fishery.

Additionally, refuge willow habitats support one of the highest density winter moose populations in Montana (Warren and O'Reilly 2005). The population has been steadily increasing by about 2% annually for the period 1966–2008 (USFWS 2008a). There is evidence that the population is demonstrating density-dependent habitat limitation (Ferguson et al. 2000). The increase in winter moose population has been concurrent with a significant decline in productivity, as measured by the ratio of calves to adults in annual surveys (Warren and O'Reilly 2005). Intense browsing of willow (Keigley and Frisina 2001, O'Reilly 2006) and aspen (Richard Keigley, research ecologist, USGS, personal interview, 2008) by ungulates has been observed within the refuge. This evidence suggests that the moose population may be limited by winter habitat. Restoring Elk Springs Creek and the upper reach of Picnic Creek will increase the available winter habitat for moose on the refuge by approximately 40 acres.

The proposed removal of MacDonald and Culver ponds will eliminate 10–20 acres (varies depending upon ice cover) of winter waterfowl habitat. These ponds were historically used to feed wintering trumpeter swans. Winter feeding at the refuge occurred from 1935 to 1992, and was an important

component of early trumpeter swan conservation efforts. The feeding program was terminated as part of a program to expand the winter range of the increasing population of trumpeter swans (USFWS 1992). According to “Midwinter Waterfowl Survey” results (USFWS 2008), the average number of wintering trumpeter swans on the two ponds during the 5 years before termination of winter feeding (1988–1992) was 348.1 ± 13.4 (mean \pm SE), with peak numbers over 800 individuals. The ponds now provide winter habitat for 40.5 ± 7.8 swans, 117.0 ± 10.6 ducks, and 2.1 ± 1.0 geese, based on 10-year averages (USFWS 2008b). Restoring Elk Springs Creek and the upper reach of Picnic Creek will eliminate waterfowl winter habitat but will further efforts to expand the winter range of trumpeter swans.

Lower Red Rock Lake and River Marsh Objective

Lower Red Rock Lake and River Marsh Objective 1:

Increase the percent coverage of pondweeds and Canadian waterweed, collectively, to >40% in Lower Red Rock Lake and River Marsh within 10 years of CCP approval.

Strategies

- Follow the “Adaptive Resource Management Plan for Lower Red Rock Lake, Red Rock Lakes National Wildlife Refuge, Montana” (USFWS 2004), throughout the life of the plan.
- Maintain the WCS for the life of this CCP, unless it is determined that removal is warranted due to negative effects on the hydrological system.
- Conduct periodic (every 4–7 years) drawdowns during the summer and fall of Lower Red Rock Lake to increase productivity of the system for the benefit of nesting target species and other waterbirds.
- In years when no drawdowns occur, maintain Lower Red Rock Lake water levels during the fall, within the constraints imposed by climatic variability and the existing WCS, at 6607.5 feet above msl for the benefit of staging and migrating waterfowl.
- Conduct ecological experiments to improve the understanding and management of the WCS and surrounding hydrological system, throughout the life of the CCP.
- Continue to monitor waterbird response to variation in habitat and climate, including trumpeter swan production and lesser scaup survival and recruitment.
- Continue to monitor SAV, climate, and water levels annually, throughout the life of the CCP.
- Unless necessary to conduct ecological studies, the WCS will be left open during the spring

and early summer for the benefit of nesting trumpeter swans and other waterfowl.

Rationale

Historical survey data and the relative forage quality of SAV were the criteria used to determine the desired species composition of Lower Red Rock Lake and River Marsh. The SAV community is currently dominated by shortspike watermilfoil (USFWS 2008c). Historical records show this species was always present but that other species were also well represented. A 1922 field report (Sperry 1922) stated shortspike watermilfoil was abundant in Lower Red Rock Lake, as well as several pondweed species, star duckweed, and quillwort. Also recorded in the report were one large bed of Canadian waterweed and several large beds of arumleaf arrowhead. Importantly, these observations were made before any form of WCS was placed on Lower Red Rock Lake.

A wooden WCS was built on the western outflow of Lower Red Rock Lake in 1930 by the state of Montana. This structure was in place for over 20 years before the first refuge survey of the SAV community in 1955–56 (Beed 1957). The greatest percent species composition measured during that initial survey was Canadian waterweed at 39%, followed by pondweeds (18%), and algae (12%). Shortspike watermilfoil was scarce in Lower Red Rock Lake (<2%). The wooden structure was replaced in 1957 with a concrete WCS with a sill height elevation of 6,607 feet above mean sea level. This new structure was built without headgates, preventing the refuge from being able to manipulate water levels.

The SAV community of Lower Red Rock Lake changed little during the 15 years after the construction of the 1957 WCS. Paullin (1973) found that shortspike watermilfoil comprised 2%–17% of the aquatic vegetation during 1956 to 1971, while pondweeds comprised 18%–42% over that same period. However, the proportion of Canadian waterweed and arumleaf arrowhead decreased during this period, the former from 60% to <1% and the latter from 8% to 1.3%. Paullin (1973) attributed the decline of Canadian waterweed to overgrazing by trumpeter swans and macro-nutrient depletion. The decline of arumleaf arrowhead is likely related to the termination of seeding by the refuge. Arumleaf arrowhead was seeded in the lakes by staff for several years after refuge establishment.

The sampling plan established by Paullin (1973) was continued on an annual basis until 1985. By this time, the species composition of vegetation comprised of shortspike watermilfoil increased to 34%, while that of pondweeds remained within its historical range, also at 34%. The 1957 WCS was replaced in 1987 with a WCS that facilitated water level manipulations via six adjustable headgates

with a sill height of 6,604 feet above mean sea level. Unfortunately, SAV surveys of Lower Red Rock Lake were not conducted between 1986 and 2001. When SAV surveys were conducted in 2002, shortspike watermilfoil had increased to 57% species composition, while pondweeds declined to 12%. The Service believes that this result can be partially explained by recent Lower Red Rock Lake water levels. The 7 years preceding this most recent survey were marked by high water levels (>6,607 feet above mean sea level) maintained in Lower Red Rock Lake throughout the summer. Relatively high static water levels during the growing season would likely favor shortspike watermilfoil, a species more common in lacustrine habitats. Additionally, consistently high water levels may negatively affect pondweeds, which are known to produce especially heavy seed crops under drought conditions (Muenscher 1936, Sharp 1951). Sago pondweed, an especially favored waterfowl food (Kadlec and Smith 1989, Kantrud 1990), ostensibly lacks competitive ability in increased water levels (Harris and Marshall 1963).

Maintenance of high water levels in the spring may also directly affect breeding waterfowl. Potential negative effects of high spring water levels include reduced availability of foodstuffs, including macroinvertebrates (Murkin and Kadlec 1986) and roots and tubers, to waterfowl during the prebreeding and breeding periods. High water levels may also delay the onset of SAV growth by limiting light penetration and causing lower water temperatures, also negatively affecting foraging waterfowl. Trumpeter swans may be particularly sensitive to elevated water levels in the early spring. Tubers are an important carbohydrate-rich food source for trumpeter swans, especially during late winter and early spring (Anderson and Low 1976, Paullin 1973, Squires and Anderson 1995). Although little is known of the nutrient dynamics of breeding trumpeter swans, many temperate breeding waterfowl are dependent upon endogenous reserves obtained during early spring for clutch formation (Alisauskas and Ankney 1992). Reduced availability of tubers could prevent prebreeding swans from attaining adequate endogenous reserves. For the above stated reasons, the WCS will be open during the spring and early summer to allow, within the constraints of the existing WCS, a naturally fluctuating hydrological cycle.

In the summer and fall, periodic lowering (drawdowns) of water levels on Lower Red Rock Lake will be undertaken to increase productivity of the wetland complex. Maintaining relatively static and high water levels, as has been done with the Lower Lake in recent history, lowers wetland productivity. Static water levels create anaerobic conditions within wetlands, limiting decomposition and nutrient cycling (Brinson et al. 1981). Persistent, deep water in wetlands also alters plant communities. Many species of wetland plants

do not germinate in deep water and can not survive if continuously flooded (Bishop et al. 1979, Harris and Marshall 1963, Kadlec 1962, Weller 1999). As a result there are greater open-water areas, reducing aquatic invertebrates and lowering avian diversity (Weller 1981, Weller and Spatcher 1965). Therefore, periodic lowering of water levels in managed wetlands is frequently recommended to mimic the natural drought cycle, stimulating the decomposition of accumulated detritus, nutrient cycling, and germination of wetland plants (Payne 1992).

Lower Red Rock Lake fall and winter water levels will be maintained at or near historic levels most years. Maintaining fall lake levels at or near 6607.5 msl will increase the amount of flooded habitat available for migrating birds. Increased water levels at this period will also provide greater winter habitat for muskrats (Bishop et al. 1979, Errington 1961), an endemic wetland species of interest due to their role in creating open areas within emergent vegetation (Weller and Fredrickson 1973) and providing nesting platforms for trumpeter swans (Banko 1960). Lastly, higher water levels in the early fall will ensure that fish utilizing the Lower Lake during the summer will be provided with routes to suitable winter habitat.

In addition to meeting specific seasonal habitat needs of wildlife, higher water levels in the fall also meet certain management objectives. The existing memorandum of understanding with downstream water users states “that whenever possible, storage in Lower Red Rock Lake will only occur during the period of October through June.” Moreover, higher water levels during these periods will benefit refuge visitors. Canoeing on the Lower Lake is permitted from September 1 to freeze-up, and waterfowl hunting begins near the end of September and is only allowed on Lower Lake within the refuge.

Recent trends in local climate (increasing temperatures and decreasing precipitation) have raised concern for the future of refuge water resources. If these trends continue, the current WCS may provide important management capabilities to protect wetland habitats. For this reason, the Service will maintain the current structure; however, if studies determine that the current WCS negatively



R. Madsen/USFWS

Waterfowl hunter on Lower Red Rock Lake.

affects the hydrology of the system, the structure may be removed.

RIPARIAN HABITAT GOAL

Maintain the processes necessary to sustain the biological diversity and integrity of native riparian vegetation for migratory breeding birds, native fishes, and wintering ungulates.

Arctic Grayling Objectives

Arctic Grayling Objective 1: Following similar restoration goals put forth by the “Montana Fluvial Arctic Grayling Restoration Plan” (MFWP 1995), the refuge will work to ensure at least three refuge streams contain adfluvial Arctic grayling spawning populations by 2013. The refuge will also work with the state of Montana to reestablish additional Arctic grayling spawning populations in other Centennial Valley creeks throughout the life of the plan.

Strategies

- Continue the systematic monitoring of the remaining grayling spawning population located in Red Rock Creek to assure its status and survival.
- Initiate site specific plans that will maintain or reestablish viable self-sustaining grayling spawning populations in the three major stream systems on the refuge; Red Rock, Odell, and Elk Springs creeks.
- Create an adfluvial grayling brood stock within Widgeon Pond (see Managed Wetland Objective 5).
- Design and implement a monitoring program that will measure abundance and population demographics of spawning Arctic grayling to determine the success of grayling recovery throughout the refuge.
- Continue to manage the health of riparian habitats and natural stream corridors to maintain stream connectivity for migrating adult grayling, and to benefit annual production.
- Where appropriate, remove nonnative fishes from refuge lakes and streams to minimize competition with native fishes, throughout the life of the CCP.
- Continue to work with cooperators to address factors affecting key population demographics of adfluvial Arctic grayling, such as adult and young-of-the-year survival.
- Work with the state and neighboring landowners to address impacts to off-refuge Arctic grayling habitat upstream of the refuge.

Rationale

Arctic grayling once existed throughout the Upper Missouri River drainage, with two distinct

life-history forms known to occur in Montana.

Fluvial (river dwelling) Arctic grayling were once widespread in this drainage but currently persist only in the Big Hole River. One of the only known populations of endemic adfluvial (lake dwelling, but use streams to spawn in) grayling in the contiguous United States reside in the Centennial Valley of southwestern Montana. Historic records indicate that these fish spawned in the tributary streams of Upper and Lower Red Rock lakes (Nelson 1954, USFWS 1978), tributaries to the main stem Red Rock River below Lower Red Rock Lake (Nelson 1954), and in streams entering nearby Elk Lake (Lund 1974). More recent surveys determined that adfluvial grayling spawning use is currently limited to Red Rock and Odell creeks (Mogen 1996, Kaeding and Boltz 1999, Kaeding and Boltz 2004), primarily on the refuge.

Concern for the survival of the adfluvial Arctic grayling population led to the development of a management plan, in cooperation with MFWP, to reestablish self-sustaining grayling spawning populations in refuge tributaries other than Red Rock Creek. A component of this plan is the establishment of an Arctic grayling brood stock in one or more refuge ponds. This brood stock would provide an egg source for restoring grayling to other Centennial Valley streams. Restoring other self-sustaining adfluvial grayling spawning populations on the refuge and in other Centennial Valley streams would reduce the risk of a natural disaster eliminating this life-history form, which is currently limited to three small populations.

Maintaining healthy riparian habitats with free-flowing stream systems not only improves the quality of life for the land-based wildlife dependent on such habitats, but these conditions also provide access to reaches of streams where lake dwelling grayling prefer to spawn. Naturally functioning stream corridors transport sediment properly and prevent bank erosion, thereby continually cleaning the stream gravels and improving spawning conditions for grayling. This results in greater numbers of grayling fry produced each year, ultimately adding to the size and health of the refuge grayling population.

Most streams of the Upper Centennial Valley, and the refuge in particular, contain suitable habitat for spawning grayling. Therefore, factors affecting the quality and quantity of non-breeding habitat may be responsible for the absence of spawning populations in streams. For example, limited overwintering habitat, high summer water temperatures, and competition with nonnative fishes in the Red Rock lakes are frequently raised as causes of grayling mortality. If these factors, independently or synergistically, are reducing survival of adult grayling, declines in the number of spawning grayling would be expected.

Arctic Grayling Objective 2: Provide relatively shallow (<16 inches) gravel and pebble (0.1–2.4 inches)

dominated, moderate flow (0.9–3.0 feet per second) habitat for spawning Arctic grayling (Sempeski and Gaudin 1995) on Odell and Red Rock creeks within the refuge, over the life of the CCP.

Strategies

- Determine current spawning grounds within Odell and Red Rock creeks within the refuge, and identify any immediate threats to these areas within 2 years of CCP approval.
- Restore irrigation ditches that influence the hydrology of streams currently used for spawning by Arctic grayling, while retaining ditches needed for grassland restoration efforts.
- Throughout the life of the CCP, work with adjacent landowners to reduce effects of cattle grazing on upstream sections of Red Rock Creek to protect and improve Arctic grayling spawning habitat. Encourage establishment of seasonal grazing and fencing systems. Encourage landowners to avoid trailing cattle through streams during peak spawning, and during fry movement and dispersal.
- Use visual assessments to examine the hydrologic function and riparian habitat quality of refuge streams in terms of the level of bank erosion, vegetation cover, and sedimentation, throughout the life of the CCP.
- Work with adjacent landowners to reevaluate the current condition of spawning habitat contained in streams (particularly Red Rock and Odell) upstream of the refuge boundary.

Rationale

The refuge provides habitat for one of the last known endemic populations of adfluvial Arctic grayling in the contiguous United States. Historically, this species spawned in numerous tributaries of Lower and Upper Red Rock lakes. Currently, spawning occurs only in Odell and Red Rock creeks. Threats to Arctic grayling include water quality (sedimentation and nutrients), as well as water quantity. High overbank flows can strand spawning Arctic grayling on streambanks, whereas low flows can result in increased sedimentation and water temperatures (Nelson 1954). Competition with and predation by introduced fish species, especially brook and rainbow trout, has also impacted Arctic grayling populations. Water diversions used for irrigation purposes through the 1970s resulted in direct mortality of adult spawning Arctic grayling and fry as they returned to the lakes. Finally, livestock grazing, both historic and current, has had a detrimental effect on Arctic grayling spawning habitat by removing vegetation and increasing sediment and nutrient loads, as well as trampling of Arctic grayling eggs and fry in the stream gravels.

Shiras Moose Objective

Shiras Moose Objective 1: Maintain at least 2,000 acres of willow-dominated riparian habitat at moderate to low browse levels for greater than eighty wintering Shiras moose throughout the life of this plan. Eighty moose is within 20% of the 1990–2009 average of moose observed wintering on the refuge.

Strategies

- Continue to exclude cattle used for prescriptive grazing from willow-dominated riparian areas.
- Continue to monitor browse levels in willow-dominated riparian habitats.
- Continue to cooperate with MFWP to conduct annual aerial surveys of wintering moose and setting of harvest regulations.
- Investigate seasonal use of willow-dominated riparian habitats by native ungulates.
- Explore seasonal movements of moose that winter on or near the refuge to determine connectivity with surrounding areas.

Rationale

Floodplain riparian habitat provides relatively stable and important wintering habitat for moose in the Rocky Mountains (Dorn 1970, Houston 1968, Poole and Stuart-Smith 2004, Stevens 1970). The Centennial Valley in southwest Montana contains the largest wetland complex in the Greater Yellowstone Ecosystem, and the associated riparian habitat supports one of the largest and highest-density wintering Shiras moose populations in the central Rocky Mountains. Most of this habitat is encompassed by Red Rock Lakes National Wildlife Refuge, situated in the eastern extent of the valley. This habitat is also believed to support the majority of the moose population within MFWP's Hunting District 334 (HD334) during the winter. The importance of the refuge as winter habitat for moose may be underscored due to assumed losses of riparian habitat in nearby areas since European settlement (Lesica and Cooper 1997).

The importance of the refuge as wintering habitat for Centennial Valley Shiras moose is difficult to quantify. Early attempts to better understand habitat use and seasonal movements of moose in the valley suggested that some of the moose that wintered on the refuge summered in the nearby Gravelly and Centennial mountain ranges (Dorn 1969). Additionally, movements of moose summering on the refuge to wintering areas in Idaho have been documented (Dorn 1969, Ritchie 1978, Schladweiler 1974). Assuming a resident population on the refuge, there are three patterns of refuge habitat utilization by moose: (1) year-round residents, (2) summer migrants, and (3) winter migrants. Although a complete understanding of seasonal movements is

lacking for the Centennial Valley moose population, peak numbers on the refuge occur during December and January (see figure 15).

Efforts to enumerate wintering Shiras moose utilizing refuge habitats have been highly variable. Survey efforts began in 1944 and peaked during the 1980s, during which time the refuge conducted monthly survey flights. Budget constraints and shifting priorities resulted in the termination of regular refuge aerial moose surveys by 1991. MFWP began conducting annual aerial surveys in 1968, but these were also limited by budget constraints and lack of personnel. Moreover, these surveys produced biased, uncorrected minimum estimates of Shiras moose numbers, assuming equal detectability among surveys. This is problematic in that variation among survey estimates includes both potential differences in detection rate and true fluctuations in animal abundance. Ultimately, this reduces the precision of abundance estimates and introduces greater uncertainty into management decisions.

Interest in the relative condition of winter Shiras moose habitat on the refuge evolved concurrently with interest in enumerating wintering moose abundance. MFWP conducted standardized browse surveys (Cole Browse Surveys) from 1965–71 to

quantify utilization of key browse plants in HD334 moose winter habitats (all four established survey transects were located on the refuge). Similarly, a willow browse transect was established by the refuge in 1982 to quantify utilization of willow by wintering moose. Although the Cole browse and willow transects differ in gross methodology and placement, they both estimate willow utilization, form class, and age class similarly within the habitat of interest. Currently, the refuge and MFWP conduct regular willow browse evaluations to assist in determining present browse levels and setting of harvest rates.

Riparian Habitat Objectives

Riparian Habitat Objective 1: Maintain at least 500 acres of moderate to dense (>40% canopy cover) willow riparian habitat to benefit breeding migratory songbirds, spawning Arctic grayling, and native ungulates, throughout the life of the CCP.

Strategies

- Continue collecting data on willow canopy cover and shrub volume along Red Rock and Odell creeks as needed to determine and monitor management actions, throughout the life of the CCP.

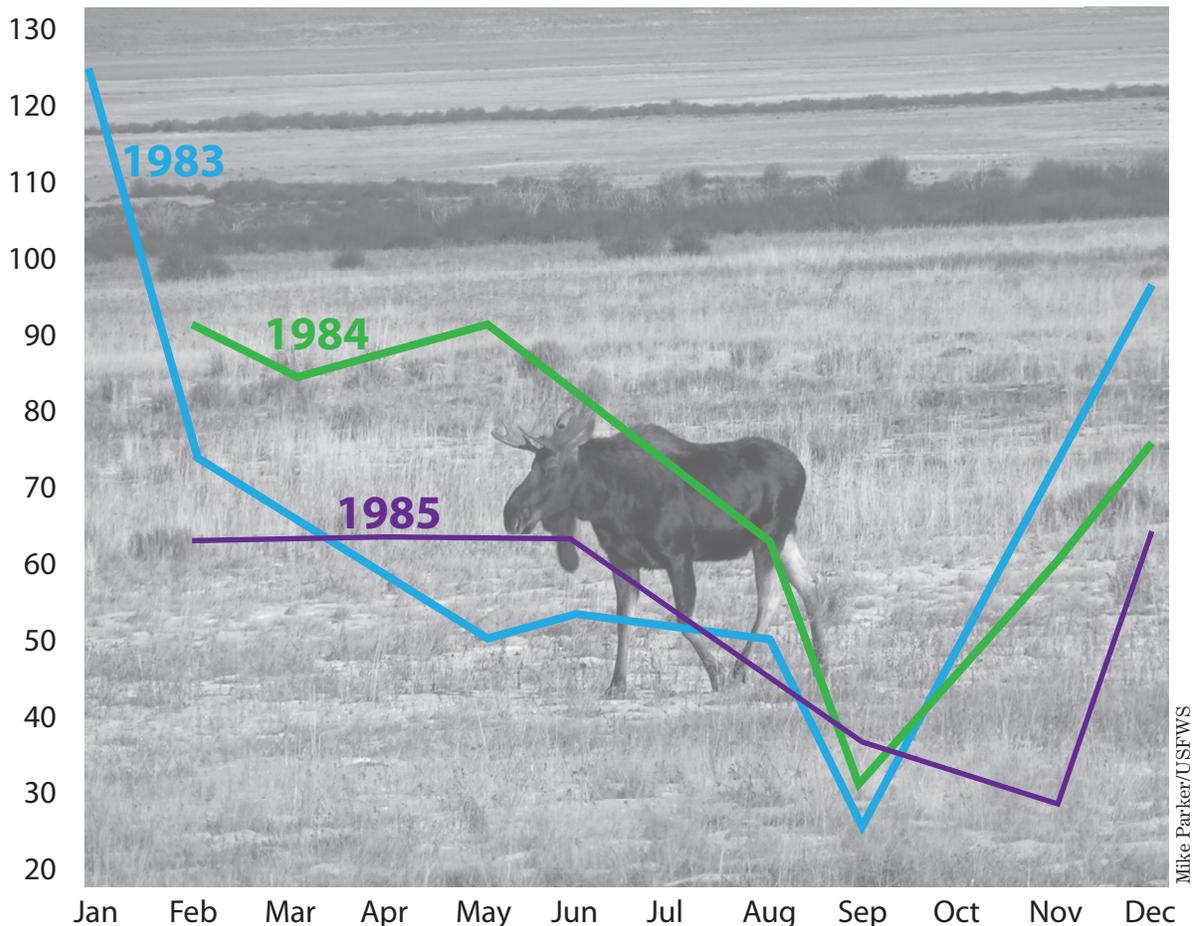


Figure 15. Intra-annual moose abundance on Red Rock Lakes NWR, 1983–1985.

- Maintain existing riparian fences and use temporary fencing, as needed, to protect riparian habitats from cattle, throughout the life of the CCP.
- Restore creeks on the refuge that currently are contained, in part, within old irrigation ditches.
- Continue to cooperate with The Nature Conservancy to conduct annual monitoring and treatment of nonnative invasive plant species, throughout the life of the CCP.

Rationale

Riparian habitat refers to “plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (rivers, streams, lakes, or drainage ways). Riparian corridors have one or both of the following characteristics: (1) distinctively different vegetative species than adjacent areas, or (2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian corridors are usually transitional between wetlands and uplands” (USFWS 1997).

Riparian habitats on the refuge are comprised of both woody and herbaceous vegetation. Woody vegetation includes Bebb, Booth’s, sageleaf, Drummond’s, narrowleaf, Geyer, Pacific, false mountain, and Wolf’s willows with scattered bog birch and shrubby cinquefoil, whereas the herbaceous community consists of various grasses, sedges, and forbs. Most of the woody species have the ability to resprout following disturbance. A large willow fen covers nearly 1,400 acres on the southeastern edge of Upper Red Rock Lake. Large stands of shrubby cinquefoil, totaling over 2,000 acres, occur throughout the refuge, with the largest stands occurring on the eastern portion. Red Rock and Odell creeks are the two largest streams on the refuge, with each supporting approximately 210 and 130 acres of willow-dominated riparian habitat, respectively. Additionally, each creek has several small tributaries with associated riparian habitat.

Hydrology is the primary determinant of riparian vegetation composition and structure (Beschta 2003, Cary 2005, Cooper et al. 2006). The most important hydrological parameters include the time, duration, magnitude, and frequency of both surface and groundwater flows. Flow magnitude is important to consider in relation to creating suitable conditions (scouring and overbank flooding) for germination. Duration and frequency of near-surface flows are critical to ensuring survival of newly established vegetation.

Hydrology also indirectly affects the periodicity, severity, and intensity of fire, which can exert tremendous influence on both the germination conditions and the structure of existing vegetation (Dwire and Kauffman 2003, Pettit and Naiman 2007). Fires in riparian habitats are typically less

intense and occur at a lower frequency than the surrounding uplands due to higher moisture content and higher relative humidity (Dwire and Kauffman 2003, Pettit and Naiman 2007). Typically, fires enter riparian habitats from the surrounding uplands, creating patches of burned and unburned habitat, and the degree to which the riparian habitat burns is related to the intensity of the fire and the width of the riparian corridor. The effect of fire on riparian habitats depends upon several characteristics, including local topography, stream size, vegetation structure and composition, and topographic aspect. Fire can also influence stream sedimentation and nutrient levels (Pettit and Naiman 2007).

The current condition of riparian habitats on the refuge is variable, depending upon which stream is considered. Woody and herbaceous vegetation exists within most stream corridors, but visual observations suggest that new germination may be lacking in some areas. A potential cause for this disruption includes water diversions that have altered the hydrologic system. In addition, nonnative invasive plant species, especially Canada thistle and common tansy, have been introduced to many stream corridors. Many riparian habitats on the refuge have been fenced out to exclude cattle, although cattle are still able to access some streams.

Plant communities associated with riparian habitats on the refuge have multiple natural resource values important in the Intermountain West region and the Centennial Valley. These communities provide breeding and stopover habitat for migratory land birds, browse and forage for native ungulates, and travel corridors for various large mammals. In addition, riparian vegetation also provides many indirect values, including regulation of stream temperatures, and nutrient inputs to streams (particularly headwater areas) that form the basis of the food chain for invertebrates, fish, reptiles, and amphibians.

Dozens of migratory land birds that occur on the refuge depend on riparian habitats for breeding or migration. Breeding bird surveys were conducted over two breeding seasons (2006–2007) in refuge willow riparian habitats. Over 70% of all bird species heard or seen were comprised of five species: yellow warbler, common yellowthroat, song sparrow, Lincoln’s sparrow, and white-crowned sparrow. These species represent a range of nesting and foraging requirements (see table 5), demonstrating the habitat diversity currently provided by refuge riparian habitats.

Data from vegetation measurements conducted along both Odell and Red Rock creeks, as well as the willow fen, show that along the creeks, tall-statured willow species predominate (primarily Booth’s, Geyer, and Drummond’s willow). The willow fen is comprised of a mosaic of low-statured (Wolf’s willow) and tall-statured willow species (primarily Booth’s,

Bebb, and Geyer's willow). It is located south and east of Upper Red Rock Lake. Canopy cover of willow averaged between 30% and 50%. In a survey conducted by field staff in 2006, it was found that the willow habitat along the creeks tended to have higher volume and structural heterogeneity than the willow fen (O'Reilly 2006).

Riparian Habitat Objective 2: Maintain low to moderate browse levels, as indicated by a positive live/dead browse index, within willow habitats for the maintenance of willow volume, canopy cover, and structural heterogeneity, throughout the life of the CCP.

Strategies

- Cooperate with the MFWP to assess the level of browse within willow riparian habitats on the refuge at least every 3 years, throughout the life of the CCP.
- If browse surveys show that browse levels are above a threshold that would sustain or improve current willow habitats, cooperate with the MFWP to develop and implement an adaptive harvest plan for native ungulates, throughout the life of the CCP.

Rationale

Herbivory can significantly influence the vegetative structure and composition of riparian habitats. Riparian habitat on the refuge is critical in maintaining native ungulate populations, particularly moose. The refuge supports one of the highest densities of wintering moose in the central Rocky Mountains. In southwest Montana, willow provides over three-fourths of summer and winter forage for moose (Dorn 1970). Dorn (1970) found Booth's willow to be the preferred browse species for moose in all seasons, as well as the most common species on the refuge. Other work has shown that Geyer willow is preferred most, followed by Booth's willow, with



USFWS

Willows are an important plant on the refuge for moose, songbirds, and beaver, who store them for winter food.

Bebb willow being the least preferred (Cary 2005, Hansen et al. 1995). Booth's willow was the most common species observed in the fen during Dorn's study; however, the majority of tall willow in the fen habitat is currently Bebb willow. This may show that at some point over the last three decades, a shift in willow species composition occurred in response to browse intensity.

The current level of willow browsing by moose was estimated during two growing seasons (2006–2007) by comparing the height of live stems to the height of stems killed by browsing (LD index) (Keigley et al. 2002). The LD index is an efficient method of

Table 5. Nesting and foraging requirements for the five most commonly detected bird species in willow riparian habitat at Red Rock Lakes National Wildlife Refuge, Montana.

<i>Species</i>	<i>Nesting Habitat</i> ^{a,b}	<i>Nesting Substrate</i> ^c	<i>Foraging Substrate</i> ^c
Yellow warbler	intermediate	shrub	shrub
Common yellowthroat	mesic, short willow, dense cover	ground	ground/low vegetation
Song sparrow	mesic, short willow, dense cover	ground	ground/water
White-crowned sparrow	xeric, tall willow	ground	ground/shrub
Lincoln's sparrow	mesic, short willow, dense cover	ground	ground

^a Finch 1989

^b Douglas et al. 1992

^c Lowther et al. 1999, Guzy and Ritchison 1999, Arcese et al. 2002, Chilton et al. 1995, Ammon 1995

assessing the level of browse pressure in the willow community and predicting related willow community trends. If live stems are taller than stems killed by browsing, this indicates light to moderate browse pressure. The estimated LD index across habitats and years was positive, indicating light to moderate browsing was occurring in willow-dominated riparian habitats on the refuge.

WET MEADOW, GRASSLAND, AND SHRUB-STEPPE HABITAT GOAL

Provide structurally-complex native meadow, grassland, and shrub-steppe habitats, within a watershed context, for upland-nesting migratory birds, sagebrush-dependent species, rare plant species, and other resident wildlife.

Target Species for Wet Meadow Habitat

Wet meadow habitats provide nesting, foraging, and brood-rearing habitat for several species of shorebirds, raptors, game birds, and passerines. To identify target species for wet meadow habitat management, several federal, state, and nongovernmental lists were reviewed to determine birds of conservation concern that breed on the refuge. Five species were selected as target species that reflect the suitable nesting and foraging requirements for wet meadow habitat on the refuge: northern pintail, long-billed curlew, sandhill cranes, short-eared owl, and greater sage-grouse (see table 6). These species were selected for a number of reasons:

- All five species use the refuge for some portion of their breeding cycle.
- Northern pintail, long-billed curlew, sandhill crane, and short-eared owl are service focal species (USFWS 2005).
- Long-billed curlew and short-eared owl are bird species of conservation concern (USFWS 2002b).
- Long-billed curlew is of concern under the “U.S. Shorebird Conservation Plan” (USFWS 2001).
- Long-billed curlew is a state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- Long-billed curlew, short-eared owl, and greater sage-grouse are listed as priority level III or higher by Montana Partners in Flight (Casey 2000).



Mike Parker/USFWS

Long-billed curlew.

Wet Meadow Objective

Wet Meadow Objective 1: Continue to provide nesting, foraging, and brood-rearing habitat for northern pintail, long-billed curlew, short-eared owl, sandhill crane, and greater sage-grouse by ensuring large, contiguous areas (5,000 acres or more) of wet meadow habitat dominated (70% or more of total canopy cover) by native graminoids (sedges, rushes, grasses) with a mosaic of relatively short (<1 foot in height) to moderately tall (1–2 feet in height) vegetation; moderate to high (30% to 70%) litter cover; and moderate (30% to 60%) canopy cover of forbs annually from mid-April to early August, throughout the life of the CCP.

Strategies

- Carry out a vegetation monitoring program to assess if target species habitat requirements are being met within 5 years of CCP approval.
- Determine long-billed curlew occupancy in wet meadow and grassland habitats on the refuge within 5 years of CCP approval.
- Determine sandhill crane occupancy in wet meadow and grassland habitats on the refuge within 5 years of CCP approval.
- Carry out a study of short-eared owls, examining their distribution, in relationship to the annual variation in small mammal abundance during the life of the CCP.
- Carry out a study to determine the influence of cattle grazing on the abundance and distribution of small mammals, the primary prey of short-eared owls, within 2 years of CCP approval.
- Use prescribed cattle grazing or prescribed fire, or both, in an adaptive management context to maintain vegetation characteristics, particularly in areas invaded by smooth brome and Kentucky bluegrass, throughout the life of the CCP.
- Prescriptive grazing and prescribed fire will only be used to achieve habitat and wildlife objectives, with increased and improved oversight, monitoring, and research conducted to assess if management objectives are being met.
- Work with partners to conduct a range survey of the refuge to assess current range health and stocking rates.
- Do not permit lethal control of carnivores (such as wolf, grizzly bear, and mountain lion) on the refuge to protect cattle used in the prescribed grazing program without permission from the refuge manager, a special use permit, and consultation with other partners who have successfully used nonlethal methods for controlling wolves preying on cattle.

Rationale

Although over 7,000 acres of the refuge are wet meadow, the most contiguous area occurs north of Upper Red Rock Lake (5,000 acres or more). Several of the target bird species have large territories (Dugger and Dugger 2002, Rowland 2004, Tacha et al. 1992, Wiggins et al. 2006), thus large contiguous areas of suitable habitat are critical. Vegetative and structural characteristics (such as a mosaic of vegetation heights and residual cover) inherent to wet meadow habitats likely provide suitable nesting, foraging, and brood-rearing habitat for these species. Data on distribution and breeding success for these species on the refuge are necessary to determine what, if any, management changes are needed.

A comprehensive literature review was conducted for these species to determine their specific habitat requirements, and management objectives for this habitat were developed based on these requirements. Requirements such as vegetation height, canopy cover, and litter or residual cover were used to create objectives for this habitat (see table 6).

Northern pintails are one of the earliest breeding North American ducks, preferentially selecting shallow ephemeral wetlands over more permanent

wetlands for breeding territories (Stewart and Kantrud 1973). Ephemeral wetlands support abundant chironomids (midges) immediately after ice melt, providing a particularly important food resource for breeding female pintails (Fredrickson and Heitmeyer 1991). Females typically select nest sites further from wetlands and with sparser vegetation than other upland-nesting ducks (Austin and Miller 1995). Refuge wet meadow habitats provide both seasonally flooded shallow wetlands and extensive areas of short, dense vegetation for nesting pintails.

Long-billed curlews typically select nests in vegetation with high vertical density in the 10- to 20-inch range (Pampush and Anthony 1993) and over 12 inches in height (Dugger and Dugger 2002). Foraging territories may be within or outside of nesting territories, as long-billed curlews are opportunistic foragers, feeding primarily on terrestrial insects such as grasshoppers (Dugger and Dugger 2002).

Sandhill cranes nesting in wet meadow habitats typically select vegetation that is between 4 and 12 inches in height early in the nesting season (late April–early May). Late in the nesting season (early June) vegetation around nests can be highly variable (between 4 and 24 inches in height), depending on

Table 6. Habitat requirements for target wet meadow bird species.

<i>Species</i>	<i>Vegetation Height (inches)</i>	<i>Vegetation Cover</i>	<i>Litter and/or Residual Cover</i>	<i>Area Requirements</i>	<i>Nesting</i>	<i>Foraging</i>
Northern pintail	< 12	Nest sites have low visual obstruction readings.	Dependent upon residual cover for nest concealment.	Nesting success positively related to larger, more contiguous, grassland area	X	
Short-eared owl	12–24	Nest sites have high visual obstruction readings. Has higher nest survival in ungrazed habitats. Avoids areas with bare ground.	2–8 years of residual cover buildup	> 250 acres	X	X
Long-billed curlew	< 12	Nest sites have low vertical profile and vegetation density.	Requires moderate residual cover for nesting	35 acres per territory with buffer of 984–1,640 feet	X	X
Sandhill crane	< 4–24	Needs adequate cover for concealment of large nest platforms.	Requires moderate residual cover for nesting	42 acres per territory		X
Greater sage-grouse	Variable	> 15% sagebrush canopy cover	Dense residual cover may hinder movements by young birds	Highly variable; summer range 130–12,000 acres for female with brood		X

Note: < = less than; > = greater than

moisture and vegetative composition. Early season water depths around nests in wet meadows average about 1.5 inches (Austin et al. 2007). Sandhill cranes are opportunistic foragers (Mullins and Bizeau 1978, Tacha et al. 1992).

Short-eared owls select nesting habitat with moderately tall vegetation, dense residual cover, and high visual obstruction readings (Dechant et al. 2003, Fondell and Ball 2004, Herkert et al. 1999, Kantrud and Higgins 1992, Wiggins et al. 2006). Major food items are small mammals, voles in particular (Wiggins et al. 2006). Voles require residual cover for the creation of extensive runways (Foresman 2001). Several studies have noted that short-eared owl annual breeding numbers are closely tied to vole numbers (Wiggins et al. 2006).

Greater sage-grouse use wet meadows contained within a mosaic of upland sagebrush that provide abundant insects and succulent forbs as brood-rearing habitat (Schroeder et al. 1999). Wet meadows may be particularly important for broods in dry years (Rowland 2004).

Target Species for Grassland and Shrub-steppe Habitat

To identify target species for grassland and shrub-steppe habitat management several federal, state, and nongovernmental lists were viewed to determine birds of conservation concern that breed in the grassland and shrub-steppe habitats on the refuge. Four bird species were selected as target species that reflect the suitable nesting and foraging shrub-steppe and grassland habitats on the refuge (see table 7): Brewer's sparrow, greater sage-grouse, Swainson's hawk, and Ferruginous hawk. These species were selected for a number of reasons:

- All four species use the refuge for some portion of their breeding cycle.
- Brewer's sparrow, Swainson's hawk, and ferruginous hawk are bird species of conservation concern (USFWS 2002b).
- All four species are state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- All four species are listed as priority level III or higher by Montana Partners in Flight (Casey 2000).
- Two other state sensitive species have breeding records on the refuge, but populations are irruptive (lark bunting), or the refuge is on the edge of their range (grasshopper sparrow).
- Ground squirrels are the primary prey of both ferruginous hawks and Swainson's hawks during their breeding season (Restani 1991). Thus, their foraging habitats are dictated by the habitat requirements of their prey.

Shrub-steppe and Grasslands Objectives

Shrub-steppe and Grasslands Objective 1: Throughout the life of the CCP, in shrub-steppe habitats, maintain at least 10% canopy cover of sagebrush with moderate (30%–70%) to high (>70%) canopy cover of native bunchgrasses for sagebrush-dependent species, including Brewer's sparrow and greater sage-grouse. Managing for these habitat attributes will also provide nesting, roosting, and foraging habitat for ferruginous hawk and Swainson's hawk.

Shrub-steppe and Grasslands Objective 2: In grassland habitats, maintain moderate (30%–70%) to high (>70%) canopy cover of native bunchgrasses and moderate forb cover (30%–70%) for brood-rearing habitat for greater sage-grouse, throughout the life of this CCP.

Strategies

- Begin vegetation monitoring of shrub-steppe and grassland habitats to ensure adequate coverage of sagebrush, native bunchgrasses, and forb to support the four target species, Brewer's sparrow, greater sage-grouse, ferruginous hawk, and Swainson's hawk.
- Conduct a comprehensive survey for nesting greater sage-grouse on the refuge within 7 years of CCP approval.
- Prescriptive cattle grazing will continue to be used as a management tool in order to meet specific wildlife and habitat objectives and reduce invasive plants, enhance native species, and reduce hazardous fuels.
- Carry out a study to determine the influence of cattle grazing on the abundance and distribution of small mammals (the primary prey of ferruginous hawk and Swainson's hawk), within 2 years of CCP approval.
- Evaluate interior fences to determine their condition and effectiveness in managing the prescriptive cattle grazing program.
- Do not permit lethal control of carnivores (such as wolf, grizzly bear, and mountain lion) on the refuge to protect cattle used in the prescribed grazing program without permission from the refuge manager, a special use permit, and consultation with other partners who have successfully used nonlethal methods for controlling wolves preying on cattle.
- The refuge will support, and participate in a MFWP led landscape-scale restoration of bison as free-ranging wildlife in southwest Montana if the state decides to pursue this initiative. The Service will not support proposals to restore bison as a captive, fenced herd.

Rationale

Idaho fescue, the dominant bunchgrass species on the refuge, can withstand light to moderate grazing, particularly if grazing occurs after flowering (Mueggler and Stewart 1980). Flowering occurs on the refuge around mid-July and coincides with the arrival of cattle. Idaho fescue is relatively intolerant to both heavy grazing and repeated overgrazing, which can lead to eventual replacement by invasive grasses such as cheatgrass (Mueggler and Stewart 1980, Zouhar 2000). Perennial needlegrass species, particularly needle and thread grass, and western and Richardson's needlegrass, make up an important component of these habitats as well. The effect of cattle grazing on needlegrasses is variable, depending upon timing of grazing. For example, needle and thread grass greens up early in the spring and is most sensitive to grazing during flowering; however, the sharp awns developed by mid- to late

summer typically result in reduced use of this grass by livestock (Zlatnik 1999).

Detailed fire histories for most shrub communities are lacking (Baker 2006). Threetip sagebrush has the ability to resprout after fire, but this resprouting capacity varies regionally and can also depend upon fire severity (Bunting et al. 1987, Lesica et al. 2005). Cover of threetip sagebrush can decrease in the early years postfire (Lesica et al. 2005). Native bunchgrasses associated with these habitats have variable responses to fire, and fire-related mortality depends upon fire severity. Fire kills the culms, but individual plants can survive if fire does not damage the root crown (Zouhar 2000). Canopy cover of Idaho fescue can return to pre-fire levels; however, livestock grazing immediately following fire can result in high (over 50%) plant mortality (Bunting et al. 1998). Perennial needlegrass species are extremely susceptible to damage by fire (Esser 1992,

Table 7. Habitat requirements for target shrub-steppe and grassland, and Centennial Sandhills bird species.

<i>Species</i>	<i>Habitat</i>	<i>Shrub Height (inches)</i>	<i>Shrub Cover</i>	<i>Herbaceous Height (inches)</i>	<i>Herbaceous Cover</i>	<i>Area Requirements (acres)</i>	<i>Response to Grazing</i>	<i>Nesting/ Brood-rearing</i>	<i>Foraging</i>
Brewer's sparrow	basin big sagebrush shrub-steppe	> 20	> 10%	n/a	> 25%		+/-	+	
Greater sage-grouse	basin big sagebrush shrub-steppe	> 16	≥ 15%	> 7	15%–25%	Highly variable; summer range 130–12,000 acres for female with brood	-	+	
Swainson's hawk	shrub-steppe grasslands	n/a	n/a	primary prey (ground squirrels and voles) depend upon abundant herbaceous vegetation	home range 1,500–6,800 acres	+/-		+	+
Ferruginous hawk	shrub-steppe grasslands	n/a	n/a	primary prey (ground squirrels) dependent upon abundant herbaceous vegetation	home range 840–2,200 acres	+/-		+	+

Note: > = greater than; ≥ = greater than or equal to; +/- = plus or minus; n/a = not applicable.

Wright and Klemmedson 1965), although they can recover if the fire is not severe enough to damage the crown (Esser 1992).

Shrub-steppe and Grasslands Objective 3: Within 10 years of CCP approval, 200 acres of smooth brome will be restored with native grass species needed to provide nesting and foraging habitat for migratory birds.

Strategies

- Determine focus areas for restoration efforts.
- Conduct experiments using a combination of prescribed fire in the spring or early fall, prescriptive cattle grazing, and mechanical and chemical treatments to determine the best method for smooth brome control and restoration of native grasses.
- Examine potential revegetation options based on the surrounding native plant communities.

Rationale

Historically, smooth brome was planted for livestock forage, and haying occurred annually on over 200 acres of refuge lands until the mid-1970s. Pure stands of smooth brome now cover approximately 1,100 acres on the refuge. Smooth brome also occurs along refuge roads, as isolated patches in wet meadows, and now dominates the understory in over 300 acres of various willow- and sagebrush-dominated habitats within the eastern and southern portions of the refuge. Smooth brome is an aggressive invader, outcompeting desirable native vegetation because of its sod-forming root system and prolific seed production. Current management includes occasional prescribed fire and cattle grazing. Smooth brome is highly tolerant to grazing (Howard 1996). Periodic spring or early fall fires can increase smooth brome productivity by removing litter; however, repeated annual spring burns can reduce tiller elongation and biomass (Willson and Stubbendieck 1997). Repeated heavy grazing during tiller elongation in spring was an effective method to reduce aboveground biomass and cover in cool-season grasslands (Stacy et al. 2005). Mowing may be ineffective if it fails to remove all of the emerging buds (Willson and Stubbendieck 1996). Treatment options also depend upon the amount of remnant native grasses and forbs available to compete with smooth brome (Willson and Stubbendieck 2000).

Target Species for Centennial Sandhills Habitat

Two bird species, Brewer's sparrow and greater sage-grouse, were selected as target species for the Centennial Sandhills habitat that reflect the suitable nesting and foraging tall sagebrush habitat on the refuge (see table 7). These species were selected for a number of reasons:

- Both species use the refuge for some portion of their nesting cycle.
- Both species are bird species of conservation concern (USFWS 2002b).
- Both species are state-listed sensitive species in Montana (MTNHP and MFWP 2006).
- Both species are listed as priority level II or higher by Montana Partners in Flight (Casey 2000).

Centennial Sandhills Objectives

Centennial Sandhills Objective 1: Maintain at least 2,500 acres of basin big sagebrush habitat with at least 10% canopy cover of sagebrush with moderate cover (30%–70%) of native bunchgrasses and forbs and moderate amounts of bare ground (30%–70%) for sagebrush-dependent species, including sage thrasher, Brewer's sparrow, greater sage-grouse, pygmy rabbit, and Preble's shrew.

Strategies

- Continue vegetation monitoring in the Centennial Sandhills to ensure adequate coverage of basin big sagebrush and native bunchgrasses.
- Continue land bird monitoring in the Centennial Sandhills to determine Brewer's sparrow densities.
- Conduct a nesting study of Brewer's sparrow to determine the demography of the population in the sandhills within 10 years of CCP approval.
- Conduct a comprehensive survey for nesting greater sage-grouse in basin big sagebrush habitats on the refuge within 7 years of CCP approval.
- Avoid prescribed fire in large areas of basin big sagebrush habitats to prevent loss of sagebrush cover.



Dave Menke/USFWS

The sage thrasher breeds in areas of dense sagebrush.

Rationale

The Centennial Sandhills are a unique habitat located in the northeastern portion of the Centennial Valley. Vegetation in the sandhills is dominated by sagebrush and native bunchgrass species. On the refuge portion of the sandhills, the dominant sagebrush species is basin big sagebrush. This tall sagebrush has an extremely limited distribution in Montana, occurring in localized stands in southwestern Montana (Morris et al. 1976). Basin big sagebrush is typically confined to areas with relatively deep, well-drained soils (Tirmenstein 1999). The average sagebrush height in the refuge portion of the sandhills is between 16 and 20 inches, although several areas have shrubs that reach heights of well over 5 feet. The sandhills are characterized by moderate to high levels of bare ground (40%–70%), and moderate to high canopy cover of native bunchgrasses (50%–90%), predominantly needle and thread, and Idaho fescue. Canopy cover of basin big sagebrush in the sandhills is low, averaging 10%. Currently, cheatgrass and pale madwort are the major invasive plant species occurring in the sandhills, although coverage is <1%.

Basin big sagebrush is killed by fire and may take at least 20 to 30 years to recover to pre-fire conditions (Lesica et al. 2005). Frequent fires will eliminate basin big sagebrush habitat (Tirmenstein 1999). Recovery of sagebrush communities is slow, in part because of the lack of availability of mature seeds, as seeds do not travel far from mature plants (Baker 2006, Welch and Criddle 2003). A fire burned nearly 2,500 acres of refuge sandhills in October 1974. It is possible that the low sagebrush canopy cover values on the refuge are a result of this fire, as previous cover was described as a “dense stand of old-age sagebrush” (USFWS 1974–1975). Canopy cover in basin big sagebrush stands that have not burned in the past 35 years averaged 20% with a height averaging about 4 feet (Lesica et al. 2005).

Brewer’s sparrow and greater sage-grouse, the target species for the Centennial Sandhills, are positively associated with sagebrush cover. Neither of these species will nest in sagebrush habitats with <10% sagebrush canopy cover (Connelly et al. 2000, Walker 2004).

Brewer’s sparrow typically nests in sagebrush shrubs over 20 inches in height (Rotenberry et al. 1999). In general, this species is not area sensitive because it will breed in small isolated sagebrush patches (Knick and Rotenberry 1995, Vander Haegen et al. 2000); however, nests can have lower productivity in these smaller fragments (Vander Haegen et al. 2000, 2002).

Active sage grouse leks on lands adjacent to the refuge are <0.5 mile from basin big sagebrush habitats on the refuge, and broods were observed on the refuge during the summer of 2006. Sage grouse females typically nest within 3 miles of lekking grounds (Wallestad and Pyrah 1974), thus it seems

probable that greater sage-grouse are nesting in this habitat on the refuge.

Two small mammal species of conservation concern, pygmy rabbit and Preble’s shrew, also occur in this habitat. Pygmy rabbits are primarily Great Basin species, but their range extends into southwestern Montana. The summer diet of pygmy rabbits is primarily grasses (over 50%) and forbs (over 30%), whereas sagebrush foliage (over 90%) is the dominant forage in winter (Thines et al. 2004). Pygmy rabbits avoid grazed habitats in eastern Washington (Thines et al. 2004) and cattle can trample burrows (Rauscher 1997). Preble’s shrew occupies arid shrub-steppe habitats with sandy soils. Nothing is known about the diet of Preble’s shrew, although other shrews eat primarily insects and worms (Foresman 2001).

Centennial Sandhills Objective 2: Work with cooperators over the next 15 years to develop a management plan for the Centennial Sandhills that will guide the management of this habitat, in a landscape context, as a mosaic of early and late-seral stages to maintain four rare early seral-associated plant species (Fendler cat’s-eye, sand wildrye, painted milkvetch, and pale evening primrose), as well as late-seral habitats.

Strategies

- Cooperate with BLM, The Nature Conservancy, and other partners to continue rare plant surveys in the Centennial Sandhills.
- Cooperate with BLM and The Nature Conservancy to determine the effectiveness of prescribed fire and cattle grazing to create or maintain early seral habitats in suitable portions of the Centennial Sandhills within 5 years of CCP approval.

Rationale

The Centennial Sandhills are well-vegetated sand dunes characterized by a mosaic of seral stages. The most topographically variable and active (migrating) sand dunes are in the western portion of the sandhills on lands owned by BLM and The Nature Conservancy. As dunes lose sand via depositional loss, the density of vegetation increases such that the dunes become stabilized and movement stops (Chadwick and Dalke 1965). Dunes in the eastern portion of the sandhills are stabilized and blowouts (windblown areas of bare sand) are rare. Two rare plant species, painted milkvetch and sand wildrye, are restricted to these blowouts and have not been documented on the refuge, whereas pale evening primrose and Fendler cat’s-eye occur in blowouts and areas of relatively recent deposited sands on the upper slopes of the dunes (Lesica and Cooper 1999). Pale evening primrose is rare in both the western and eastern sandhills, but Fendler cat’s-eye is very common, particularly in the eastern sandhills. Late

seral habitats are dominated by basin big sagebrush on the refuge and threetip sagebrush on the western sandhills. Both of these communities are unique in Montana (Cooper et al. 1999).

ASPEN FOREST, MIXED CONIFEROUS FOREST, AND WOODLAND HABITAT GOAL

Create and maintain aspen stands of various age classes within a mosaic of coniferous forest and shrubland for cavity-nesting birds, and other migratory and resident wildlife.

Aspen Forest and Woodland Objective

Aspen Forest and Woodland Objective 1: Determine the historical and current extent of aspen, current levels of aspen regeneration, and current browse levels by elk and moose within aspen stands on the refuge and surrounding lands in the Centennial Valley within 5 years of CCP approval.

Strategies

- Develop a monitoring plan in conjunction with cooperators to monitor levels of aspen browse in the Centennial Valley.
- If aspen monitoring indicates continued intense browsing, work with partners to develop an adaptive management plan that incorporates native ungulate harvest and large-scale disturbances to benefit aspen.
- Supplement aspen stand delineation via aerial photo interpretation with intensive ground-sampling based on existing data regarding aspen distribution in the Centennial Valley.

Rationale

Large-scale declines of aspen across the American West have been widely distributed, likely caused by a combination of factors, including global climate change, high-levels of ungulate herbivory, and conifer encroachment due to fire suppression (Bartos and Campbell 1998). The Centennial Mountains have seen declines of aspen as great as 80% (Gallant et al. 2003, Korb 2005, Korb et al. 2008). Browsing by native ungulates, especially elk and moose, can significantly reduce aspen regeneration and the ability of stems to grow above browse height (Berger et al. 2001, Romme et al. 1995). The collection of data using the LD index on the current level of aspen regeneration (number of stems/acre) and browsing (Keigley et al. 2002) in the Centennial Valley was started by The Nature Conservancy in the summer of 2006. Preliminary results show that regeneration at current browse levels will be very limited. Additionally, some historic aspen stands have been lost, as evidenced by areas of downed aspen or aspen snags and lack of young aspen stems. The degree to which this loss has occurred throughout the Centennial Valley is unknown.

The Centennial Valley is part of the MFWP Gravelly Elk Management Unit, Hunting District 327. Elk populations in this management unit have more than doubled since 1985 (MFWP 2004). Wintering moose populations on the refuge have also increased four-fold from 1966–2008, with approximately 100 moose currently wintering on or near the refuge (USFWS 2008a). The inability of aspen stems to grow above browse height, coupled with the increase in elk and moose numbers, suggests that intense browsing may be limiting regeneration of aspen in the Centennial Valley.

Aspen provides the only deciduous tree habitat in montane regions of the Rocky Mountains. This habitat has higher biodiversity and productivity than the surrounding upland habitats (Hansen et al. 2000) and is extremely valuable to breeding birds (Dobkin et al. 1995, Finch and Reynolds 1987, Martin et al. 2004). Aspen within a mosaic of coniferous forest is used for nesting disproportionately to its availability (Martin et al. 2004). In particular, primary cavity excavators (such as woodpeckers) create nesting and roosting cavities for a complex community of species. As aspen age, they invariably become infected with fungal heartrot (Hinds 1985). This susceptibility to heartrot creates ideal conditions for cavity excavation (Aitken et al. 2002, Hart and Hart 2001). Several primary cavity-nesting species and secondary cavity-nesting species (nonexcavators) breed in aspen habitats on the refuge, including northern flicker, red-naped sapsucker, house wren, American kestrel, and tree swallow. Other bird species that nest in aspen habitat are ruffed grouse, dusky flycatcher, cordilleran flycatcher, western wood-pewee, warbling vireo, and broad-tailed hummingbird.

Several birds that breed in aspen habitats are listed as species of conservation concern by the Service (red-naped sapsucker; 2002), by the state of Montana (broad-tailed hummingbird; 2006), or by Montana Partners in Flight (red-naped sapsucker, warbling vireo, ruffed grouse, cordilleran flycatcher, and dusky flycatcher; 2000). All of these species require large trees with a dense canopy (Dobkin et al. 1995, Gardali and Ballard 2000, Lowther 2000, Rusch et al. 2000, Sedgwick 1993).

Mixed Coniferous Forest and Woodland Objective

Mixed Coniferous Forest and Woodland Objective 1: Provide wildland–urban interface (WUI) protection and prevention measures around Lakeview based on strategies developed in an interagency fire management plan.

Strategy

- Work with BLM and Forest Service to develop a fire management plan that will use prescribed fire and mechanical treatments to thin conifer stands and reduce hazardous fuels, minimizing the threat to life and property.

Rationale

Wildland fire management must be coordinated across administrative boundaries to reach management goals. It must balance fire suppression methods to protect property and other resources with the use of fire to maintain and promote healthy ecosystems. The development of a fire management plan for the WUI surrounding the town of Lakeview will serve to protect homes and other structures and also allow land management agencies to adopt wildland fire use principles that will support minimal suppression of wildland fire in these habitats.

A 13,600-acre lightning-ignited fire occurred in mixed coniferous forests in the western Centennial Mountains in 2003, burning nearly 1,000 acres of the refuge. Aside from this fire, wildland fires have been essentially absent from coniferous forests in the Centennial Valley for nearly 150 years (Korb 2005). This absence of fire, in combination with mountain pine beetle and spruce budworm outbreaks, and a complex interaction between climatic patterns and fuels, has created suitable conditions for wildland fire to occur in this habitat. Continued maintenance of coniferous forests through natural disturbance will provide habitat for a diverse assemblage of breeding birds.

Several bird species of conservation concern breed in coniferous forests on the refuge. These include Williamson's sapsucker (Casey 2000, MTNHP and MFWP 2006, USFWS 2002b); olive-sided flycatcher, three-toed woodpecker, great gray owl, northern goshawk, brown creeper (Casey 2000, MTNHP and MFWP 2006); and Calliope's hummingbird, Townsend's solitaire, red crossbill, Cassin's finch, and Clark's nutcracker (Casey 2000). Several bird species are also closely associated with burned coniferous forests, including black-backed woodpecker (Casey 2000, MTNHP and MFWP 2006), three-toed woodpecker, and olive-sided flycatcher, which is often more abundant in burned forests than unburned forests (Altman and Sallabanks 2000). The overall guidance for use of prescribed fire and management of wildland fire is in the description of the fire management program in appendix H.

VISITOR SERVICES AND CULTURAL RESOURCES GOAL

Provide quality wildlife-dependent recreation, environmental education, interpretation, and outreach opportunities that nurture an appreciation and understanding of the unique natural and cultural

resources of the Centennial Valley, for visitors and local community members of all abilities, while maintaining the primitive and remote experience unique to the refuge.

Hunting Objective

Hunting Objective 1: Continue to provide and expand hunting opportunities for elk, white-tailed and mule deer, moose, pronghorn, ducks, geese, and coots within modified refuge hunting area boundaries. Seventy-five percent of hunters will report a safe, quality hunting experience that enriches their personal lives while supporting preservation of the unique qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- Hunting boundaries will be modified and expanded to eliminate boundary confusion, address law enforcement issues, address impacts to habitat due to increasing populations and unnatural concentrations of large ungulates (particularly in closed areas), and provide additional opportunities (see figure 14).
- Big game hunting for elk, pronghorn, and mule and white-tailed deer will continue to be permitted on current and expanded portions of the refuge (see figure 14).
- Open the area west of South Valley Road near Saier Corrals to create a contiguous moose hunting area, eliminating hunting boundary confusion. Close the area south of South Valley Road (Red Rock Pass Road) to eliminate a road hunting issue.
- To maintain a quality and ethical hunt and to reduce the potential for crippling elk in the area north of South Valley Road, south of Red Rock Creek, west of Upper Red Rock Lake to the west boundary, except for the closed portion east of Lakeview to Odell Creek, the refuge may pose restrictions such as limiting the number of hunters, shortening the season, or changing the method of harvest.



Great gray owl.

- The refuge will continue the practice of opening moose hunting later than the state moose hunting season. In collaboration with MFWP, this hunting season may be modified (lengthened or shortened further) in the future to meet habitat and population objectives.
- To address illegal road hunting, no big game hunting will be permitted within 50 yards of the centerline of any county or refuge road.
- Develop the hunting chapter within the Visitor Services Plan.
- Hunting for duck, goose, and coot will continue to be permitted on and adjacent to Lower Red Rock Lake under state and federal regulations and seasons (see figure 14).
- Provide one accessible hunting blind for hunters with disabilities (also used for wildlife observation and photography) downriver from Lower Lake.
- Open areas closed to hunting for other public uses according to refuge regulations, in order to promote other wildlife-dependent activities during hunting seasons. The area around residences and maintenance facilities will remain closed to all public uses.
- The public will continue to be provided access down Idlewild Road, primarily used for waterfowl hunting. The refuge will post a sign recommending that only 4-wheel drive or high clearance vehicles utilize the road. The road may be closed at any time due to weather and road conditions.
- Create a hunting regulation brochure that meets Service graphic standards.
- Conduct random hunting surveys to determine the quality of visitors' hunting experiences.

Rationale

Hunting is considered by many to be a legitimate, traditional recreational use of renewable natural resources. The National Wildlife Refuge System Act of 1966, other laws, and the Fish and Wildlife Service's policy permit hunting on a national wildlife refuge when it is compatible with the purposes for which the refuge was established. National wildlife refuges exist primarily to safeguard wildlife populations through habitat preservation.

The word "refuge" includes the idea of providing a haven of safety for wildlife, and as such, hunting might seem an inconsistent use of the National Wildlife Refuge System. However, habitat that normally supports healthy wildlife populations produces harvestable surpluses that are a renewable resource. As practiced on refuges, hunting does not pose a threat to the wildlife populations, and in some instances, are necessary for sound wildlife management.

The refuge is part of a larger ecosystem known as the Greater Yellowstone Ecosystem. Most wildlife species migrate on and off the refuge. Working with MFWP is vital in balancing wildlife populations needed to provide a quality experience for visitors while ensuring habitats are protected from overpopulated and unnaturally concentrated wildlife. In the past, elk regularly concentrated on the refuge's closed areas during the fall hunting season. This unnatural concentration of elk not only impacted refuge habitats (see Aspen and Woodland Objective Rationale), but contributed to the continued overpopulation of elk in this valley, impacting other Centennial Valley habitats. Surveys also indicate a consistent increase in moose populations and increases in browse use, supporting the state's continued limited harvest (currently eleven permits annually) within this hunting unit and the refuge.

The open landscape of the Centennial Valley allows for excellent scouting for big game animals from the road. This sometimes leads hunters to harvest animals illegally by shooting from the road. By adopting a 50 yard closure state regulation (currently used for the state's bison hunt program outside of Yellowstone), the refuge hopes to address this issue.

Currently, the refuge hunt area boundaries and regulations are confusing. By carrying out the strategies, confusing hunting boundaries will be eliminated, additional quality hunting opportunities will be provided, and hunters will be better informed of the location of boundaries and regulations.

Expanding big game hunting areas will serve various purposes. It will eliminate confusion associated with existing hunting boundaries by creating more clearly, easily defined boundaries. It will support the state's elk population objective in the elk management unit that encompasses the refuge. Current population levels exceed state objectives and the refuge's closed area has caused unnatural concentrations of elk during the hunting season. The refuge works with MFWP to meet their elk management objectives; elk are a state-managed species. Elk populations are not imperiled and are more than sufficient in numbers to allow for additional harvest. The expanded portion of the refuge that will now be open to big game hunting is within Red Rock Lakes Wilderness and other roadless areas. Since it is roadless, it will be challenging to hunt and retrieve animals. Nevertheless, we anticipate this disturbance will better disperse elk, while allowing for additional opportunities for a quality hunting experience. The Service does recognize the need to carefully plan and execute these hunts initially, making sure law enforcement is present to ensure they are conducted ethically and safely. The Service may also need to utilize other methods, such as limiting the number of hunters, to achieve this goal. Eventually, the elk will move into other areas more naturally, distributing themselves throughout the valley. Finally, these reduced elk numbers should assist the

refuge and surrounding land management agencies in addressing the lack of regeneration of aspen and other tree species heavily browsed by overabundant elk.

Fishing Objective

Fishing Objective 1: Continue to provide quality fishing opportunities to visitors in a remote, wild setting, with minimal disturbance to migratory birds. These encounters will enrich visitors' personal lives while garnering support for preserving the unique qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- Continue to allow fishing on Odell, Red Rock, and Elk Springs creeks under state river and streams regulations.
- Open all refuge streams to fishing in compliance with refuge, and the state's river and stream regulations.
- Widgeon Pond, and until they are restored, MacDonald and Culver ponds will be open under state river and stream regulations to fishing from the bank unless closure is necessary to protect nesting swans or Arctic grayling restoration efforts.
- Update fishing regulations in the general brochure.
- Produce a fishing regulation “tear sheet” or produce a combination hunting/fishing regulation “tear sheet.”
- Improve or replace existing signage.
- Encourage all visitors to keep nonnative fish in accordance with state regulations.
- Open Red Rock Creek west of the Lower Lake WCS to fishing.
- Work with refuge partners to determine population numbers of native and nonnative fish species and potential impacts from fishing.
- Conduct random fishing surveys to determine the quality of visitors' fishing experiences.
- Prevent the spread of aquatic nuisance species by increasing angler awareness through signage, educational brochures, and other techniques.

Rationale

Fishing is one of the priority public uses for the Refuge System and a popular activity on Red Rock Lakes National Wildlife Refuge. Fishing can also play an important role in control of nonnative fish populations for the benefit of Arctic grayling and Westslope cutthroat trout. Fishing is not permitted on the lakes for various reasons, the most important of which is to provide refuge for breeding, staging,

and migrating trumpeter swans and other migratory birds. Opening all creeks to fishing will provide additional opportunities for visitors.

Wildlife Observation and Photography Objective

Wildlife Observation and Photography Objective 1:

Provide visitors of all abilities with more opportunities to view and photograph wildlife in a wilderness setting. These encounters will enrich visitors' personal lives while garnering support for conserving the unique qualities and natural resources of the refuge and Centennial Valley for future generations.

Strategies

- Maintain wildlife observation and photography opportunities during hunting seasons by using geographic separation. The eastern ponds section (north of Red Rock Creek, east of Elk Lake Road) will be closed to hunting, but open to foot traffic by the public year-round, and to vehicles for a portion of the year.
- Work with Beaverhead County to provide accessible pulloffs for the safe viewing of wildlife and photography. Each site will be interpreted through an interpretive sign or auto-tour brochure.
- Establish an auto tour route for wildlife observation on existing refuge roads open to the public (see figure 14). An auto tour route will require replacing Red Rock Creek Bridge. The auto tour route will be interpreted through a brochure and minimal signage.
- Produce a fish and wildlife checklist that meets Service graphic standards.
- To eliminate confusing regulations, open all refuge roads to vehicles from May 15 to December 2. All roads may be closed at anytime due to weather conditions. An exception is Widgeon Pond Road, it may be closed to minimize disturbance to nesting swans.
- Add a wildlife observation and photography question to the interpretation questionnaire to measure results and quality of enhanced programs.
- Shambow Pond will remain closed to all public access and use.
- Build an accessible blind downriver from Lower Lake (see figure 14) for wildlife observation and photography, and hunting.
- Allow nonmotorized boating on Red Rock Creek and Upper Red Rock Lake from July 1 to freeze-up. Lower Red Rock Lake and River Marsh connecting the two lakes are open September 1 to freeze-up.

Rationale

The refuge is located in one of the most undeveloped and beautiful valleys in Montana, the Centennial Valley. This picturesque setting, combined with rich habitats, make wildlife observation and photography the most popular wildlife-dependent recreational activity at the refuge. There are a few developed trails and some roads from which visitors can view and photograph habitats and wildlife; however, most have not been adequately marked or identified on a map, so they are not obvious to the less adventurous visitor. There are areas where these opportunities could be expanded, but it is also critical that the wilderness characteristics that bring visitors to the refuge be maintained. Shambow Pond will continue to be closed to protect nesting trumpeter swans.

Interpretation Objective

Interpretation Objective 1: Ensure that 75% of refuge visitors will understand they are on a national wildlife refuge where wildlife comes first. These visitors will also understand the purposes and significance of Red Rocks Lakes National Wildlife Refuge and the value of conserving the natural resources of the Centennial Valley.

Strategies

- Recruit a GS-6 temporary visitor services specialist (same as the Outreach objective).
- Develop a common theme for all refuge interpretation that supports and promotes the refuge's purposes, protection of the Centennial Valley, and the unique qualities of being part of the Refuge System.
- Ensure that all current and future brochures and other refuge literature meet Service graphic standards.
- Design and install a comprehensive interpretive package (such as signage, displays, hands-on exercises, and literature) for the visitor contact area.
- Install a new kiosk at the refuge's west entrance on the road to Lower Red Rock Lake. Replace three degraded kiosks at Upper Lake campground, Elk Lake Road, and the east entrance. Design and install two updated interpretive panels at Shambow Pond near the pulloff and the sandhills. Design and install updated panels at the four existing kiosks, and at the one new kiosk.
- Staff the visitor contact area on weekends during months of high visitor use.
- Retain a primitive visitor experience while ensuring that the auto tour route is adequately interpreted with a brochure and low profile interpretive panels.
- Improve signs to ensure all visitors are oriented and understand refuge-specific regulations.

- Improve Sparrow Pond Trail so it is an accessible trail.
- Partner with the BLM and Forest Service to develop interpretive panels at Monida Hill and Red Rock Pass that highlight the value of the refuge and Centennial Valley as a critical wildlife corridor between the Bitterroot and Greater Yellowstone ecosystems.
- Measure results using a visitor questionnaire.

Rationale

The refuge offers excellent opportunities to interpret wildlife resources, the Refuge System, and the large intact landscapes found in the Centennial Valley and southwest Montana. By providing the opportunities listed above, visitors to the refuge should be well informed of refuge resources and its role within this large, undeveloped landscape. Any interpretive facilities will complement the wilderness, rustic qualities of the refuge while better orienting and educating visitors.

Environmental Education Objective

Environmental Education Objective 1: Work with partners to provide annual on-site environmental educational programs for up to five organized groups and 300 visitors and students of all abilities to foster an environmental ethic, and an understanding and appreciation of the issues and programs of the refuge and the value of the natural resources of the Centennial Valley.

Strategies

- Recruit a GS-6 temporary visitor services specialist (same as Interpretation Objective).
- Work with partners to develop environmental educational programs that support and promote the refuge's purposes, protection of the Centennial Valley, and the unique qualities of being part of the Refuge System.
- As part of each program, measure results through verbal and written questions.
- Expand the refuge's website to include educational tools, such as classroom projects and online exercises that educate students about the Refuge System and the values and importance of refuge and Centennial Valley resources. Results will be measured by an online questionnaire, and website usage will be monitored.

Rationale

The refuge is a popular destination to learn about and observe wildlife, hosting approximately 12,000 visitors annually, primarily during the summer and fall months. Providing environmental education will help visitors and students gain a better understanding of the refuge, its wildlife, and its role in the larger Greater Yellowstone Ecosystem. The

refuge has opportunities to provide environmental education to groups, students, and overnight visitors; nevertheless, the refuge is remote and county roads are minimally maintained; particularly fall through spring. This objective is modest, recognizing these limitations, while capturing those opportunities to educate students and visitors who do make the journey to this refuge within the spectacular Centennial Valley.

Outreach Objective

Outreach Objective 1: Reach out to local, state, and federal representatives; local communities; landowners; nongovernmental organizations; and current and potential partners to promote an understanding of refuge purposes and management objectives and to garner support for management actions and the conservation easement program.

Strategies

- Promote participation by local landowners in conservation easement programs by providing information on the programs' benefits to the conservation of the valley and in promoting and preserving their way of life.
- Conduct annual visits and provide a briefing paper to local, county, state, and federal governments that highlights current refuge programs and challenges.
- Continue to work with nongovernmental organizations on projects of mutual interest, where appropriate, ensuring that projects support and enhance the refuge's purposes and the mission of the Refuge System.
- Measure the results of the outreach program by determining the level of support and understanding for refuge resources; current and proposed management programs; and the goals of the Refuge System.

Rationale

The refuge has many challenges and opportunities related to its remote location and wilderness characteristics. Because of the wild, undeveloped landscape of the Centennial Valley, the refuge has the opportunity to work with many partners to protect a large landscape and to provide travel corridors and near-pristine habitat for far-ranging wildlife such as wolves, grizzly bears, wolverine, elk, pronghorn, and waterfowl and other migratory birds. Outreach opportunities will encourage visitors, local communities, landowners, and governments to gain a better understanding of the values of the Centennial Valley, the refuge, its resources, management issues, and the Refuge System.

Campgrounds Objective

Campgrounds Objective 1: Continue to provide two primitive campgrounds with a total of approximately seventeen campsites at Upper and Lower lakes to accommodate wildlife-dependent recreation in this remote wilderness setting.

Strategies

- Rehabilitate campground facilities, such as fire rings and access roads.
- Create an accessible campsite at River Marsh campground and improve the current accessible site at Upper Lake.
- Replace the restrooms at the campgrounds to make them accessible.
- Establish a recreational fee program by 2010 to provide added resources for maintaining the campgrounds.

Rationale

It is a policy of the U.S. Fish and Wildlife Service that, "We may allow other activities on refuges, such as camping, to facilitate compatible wildlife-dependent recreation" (605 FW 1, 1.2B). Due to the remote location of this refuge, the great majority of visitors using these campgrounds participate in wildlife-dependent activities on and adjacent to the refuge. The campgrounds allow visitors to stay multiple days to thoroughly experience the refuge, whether they are bird watching, hunting, fishing, hiking, or just experiencing wilderness solitude. Only one other location in the Centennial Valley provides a pit toilet. This is located just north of the refuge at Elk Lake—about 17 miles from headquarters. Elk Lake's primitive campsites are also well used by visitors who are fishing and hunting on other public lands. The refuge's campgrounds also provide a critical watering and stopping point for visitors hiking or biking the Contiguous and Great Divide trails, which both traverse the refuge.



This remote refuge has four houses for refuge staff.

Cultural Resources Objective

Cultural Resources Objective 1: Identify, value, and preserve the cultural resources and history of the refuge to connect the refuge staff, visitors, and the community to the area's past, while ensuring that 100% of known cultural resources are protected from federal and visitor activities.

Strategies

- Continue to conduct site-specific surveys for lands and facilities that may be disturbed by refuge management activities.
- Continue to maintain historic properties currently in use.
- Through partnerships, begin preparing a comprehensive, refuge-wide survey to determine the presence of cultural resources on the refuge.
- Design and print a brochure to interpret select cultural resources and historic structures.
- Address cultural resources in the auto tour interpretive brochure.

Rationale

The refuge has many known historical structures, many of which are still in use, including the refuge office, two residences, and a storage building. The Centennial Valley also has a rich history of Native and Euro-American presence. Federal laws and policies mandate the identification and protection of cultural resources on federal lands. Specifically, Section 106 of the National Historic Preservation Act requires all federal agencies to consider impacts on cultural resources before any federal action. Ideally, a comprehensive refuge-wide inventory will help ensure the protection of these resources. However, these inventories take time and are very costly, which is why most refuges have not completed surveys. Nevertheless, the law requires all federal activities that have the potential to impact cultural resources be evaluated. Throughout the life of this 15-year plan, the refuge will work with other partners, including the regional archaeologist and staff, to begin documenting cultural sites on the refuge. Until this survey is completed, the refuge staff will continue to work with the regional archaeologist to evaluate projects with the potential to have impacts, on a case-by-case basis.

REFUGE OPERATIONS GOAL

Prioritize for wildlife first and emphasize the protection of trust resources in the utilization of staff, funding, and volunteer programs.

Staff Objective

Staff Objective 1: Add the needed staff within 5 years of CCP approval; this includes temporary employees and volunteers necessary to fully carry out the CCP.

Strategies

- Recruit a WG-6 permanent seasonal maintenance worker to help with the large maintenance backlog in support of all refuge programs.
- Recruit one full-time permanent GS-5/7/9 wildlife biologist and at least three temporary biological science technicians.
- Recruit one full-time permanent GS-7 range technician.
- Use additional management capability money to recruit temporary employees, develop and implement the visitor services program, and enhance habitat management and monitoring.
- Annually recruit a temporary visitor services specialist.
- Annually recruit a temporary office assistant.
- Given the added staff and complexity of the expanded refuge programs, evaluate grade levels of current refuge staff.
- Require one staff member to maintain collateral duty law enforcement credentials to provide for the safety of visitors, staff, facilities, and wildlife.

Rationale

Additional staff, including permanent, temporary, permanent seasonal, and volunteer employees, will be necessary in order to carry out the objectives and strategies identified in the CCP. The funding for permanent employees is included in the refuge's base budget, and they return each year, either full-time or seasonal. Temporary employees are funded using annual project money for various refuge programs such as biology, administration, and maintenance. Most employees work for less than six months, but may be employed anytime of the year. Since these temporary positions are based on annual funding, there is no commitment to renew them each year. There have been many needs identified in the CCP such as suggested improvements to the existing maintenance, habitat management and monitoring, law enforcement, and visitor services programs. Many of these changes are dependent on the availability of additional staff to design and execute these new programs. These additional positions will be critical to achieving the vision and goals presented in the CCP. There has been little change to the number of permanent staff and no added housing since the 1950s. Nevertheless, visitor numbers have increased since the refuge was established. Facilities, many historical, are in disrepair, issues have changed and become more challenging, and there

are new opportunities and technologies available to better understand and manage refuge resources. Accommodating visitors and managing the refuge properly takes more than money, it takes people with the expertise to develop and carry out programs. These added challenges and increased staff size, combined with the large area of responsibility, should also warrant evaluating the grade levels of current staff positions.

Facilities Objective

Facilities Objective 1: Maintain, create, or rehabilitate facilities to provide staff and visitors of all abilities with a safe and quality experience while preserving and complementing the remote wilderness character of the refuge.

Strategies

- Construct up to four new residences.
- Build three trailer pads for housing volunteers to support refuge programs.
- Improve parking at headquarters, Odell Creek and Sparrow Pond trailheads, and the entrance to Lower Lake Road.
- Replace all vault toilets with “clean-smelling” technology vault toilets, making them universally accessible to meet requirements of the Architectural Barriers Act Accessibility Standard for Federal Facilities. Develop accessible parking and access routes to all accessible facilities.
- Provide a universally accessible boat launch (hardened surfaces) at Lower Lake for persons with disabilities.
- Provide an accessible trail to Sparrow Pond.
- Replace Red Rock Creek Bridge on Culver Road (currently open to the public) with a new bridge, to allow for development of an auto tour route, and replace Sparrow Pond Trail Bridge used for foot traffic and by heavy equipment to maintain water control structures.
- Provide accessible pulloffs along the auto-tour route for the safe viewing of wildlife and photography.
- Investigate the feasibility of rehabilitating the historic fire tower, in keeping with regulations, and opening it to public access.
- Replace three kiosks and add one new kiosk.
- Replace and update all interpretive panels and signage to ensure visitors are oriented, informed, and feel welcome.
- Improve road, campsites, and parking at Upper Lake campground.
- Rehabilitate existing refuge residences (Q94 foundation repair, Q94 and 110 garage replacement, Q1 foundation and interior rehabilitation, Q90 health safety/attic, and windows in most residences) and restore or stabilize other historic structures (headquarters log barn, Shambow Creek barn, and fire tower).
- Repair and rehabilitate the shop building to be more in keeping with the historic site.



Red Rock Lakes National Wildlife Refuge, Montana.

Table 8. Current and proposed staff, Red Rock Lakes National Wildlife Refuge, Montana.

<i>Program</i>	<i>Current Positions</i>	<i>Proposed changes/added positions</i>
Management	Refuge manager, GS-13	
	Assistant manager, GS-11	Evaluate this management position for upgrade to the next grade level.
Biological	Wildlife biologist, GS-11	Evaluate the current biologist position for an upgrade to a GS-12. GS-5/7/9 full-time permanent wildlife biologist. GS-7 full-time permanent range technician. At least three temporary biological science technicians.
Administrative	Administrative support assistant, GS-7	Temporary administrative assistant (generalist).
Maintenance	Maintenance worker, WG-8	Additional temporary WG-6 maintenance worker.
Visitor Services	None	GS-6 temporary visitor services specialist

- Replace existing boundary fencing and construct new boundary fencing for newly acquired lands.
- The public will continue to be provided access down Idlewild Road. The refuge will post a sign recommending that only 4-wheel drive or high clearance vehicles utilize the road. The road may be closed at any time due to weather and road conditions.

Rationale

One of the greatest limitations to expanding the refuge's biological and visitor services programs is the lack of staff and facilities. The refuge is located in one of the most remote valleys in Montana where there is often no available housing; thus, the Service needs to provide housing for all staff. Currently, all refuge houses are occupied by existing staff. Adding any new positions will require additional housing.

Existing staff and visitor facilities (such as buildings, signs, kiosks, roads, fences, trails, parking, and campgrounds) are also in need of major repair or replacement in order to provide for a safe, productive working environment and to promote the refuge and its resources in an effective, safe, and professional manner. Maintenance of these facilities will require some additional funding but most importantly, an additional permanent seasonal maintenance person (see Staff Objective 1).

4.3 STAFFING AND FUNDING

Current staffing at the refuge consists of five permanent full-time employees. Table 8 shows the current staff and proposed additional staff required to fully implement the CCP. Due to the area of responsibility and added complexities of this plan all grade levels for current staff will be evaluated. If all

positions are funded, the refuge staff will be able to carry out all aspects of this CCP, which will provide maximum benefit to wildlife, improve facilities, and provide visitor services. Projects that have adequate funding and staffing will receive priority for accomplishment. Staffing and funding are requested for the 15-year life of this CCP.

4.4 STEP-DOWN MANAGEMENT PLANS

The CCP is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, visitor services, and partnership objectives over the next 15 years. The purpose of the step-down

Table 9. Step-down management plans for Red Rock Lakes National Wildlife Refuge, Montana

<i>Plan</i>	<i>Completed Plan, Year Approved</i>	<i>New or Revised Plan, Completion Year</i>
Habitat Management	—	2015
Fire Management	2002	2011
Disease Contingency	2006	2017
Wilderness Management	1986	2015
Refuge Safety	2008	2011
Visitor Services	1986	2014
Wildlife Inventory and Monitoring	—	2016
Spill Prevention Control and Countermeasures	2006	2013

management plans is to provide greater detail to managers and employees for carrying out specific actions and strategies authorized by the CCP. Table 9 presents the plans needed for the refuge, their status, and the next revision date.

4.5 PARTNERSHIP OPPORTUNITIES

A major objective of this CCP is to establish partnerships with landowners, volunteers, private organizations, and county, state, and federal natural resource agencies. In particular, landowners will be informed of opportunities to participate in compensated habitat protection programs (such as conservation easements). Opportunities exist to enhance or establish new partnerships with nonprofit organizations, sporting clubs, community organizations, and educational institutes. Strong partnerships already exist with The Nature Conservancy, MFWP, Montana State University, Beaverhead County Weed District, Centennial Valley Association, and Centennial Valley Historical Society.

4.6 MONITORING AND EVALUATION

The Service proposes that the uncertainty surrounding habitat management can be dealt with most efficiently within the framework of adaptive resource management (ARM) (see figure 16) (Holling 1978; Kendall 2001; Lancia et al. 1996; Walters and Holling 1990). This approach provides a system within which objective decisions can be made and the uncertainty surrounding those decisions reduced. Briefly, the key components of an ARM plan follow:

1. Clearly defined management goals and objectives.

2. A set of management actions with associated uncertainty as to their outcome.
3. Various alternative working hypotheses describing the response of species or communities of interest.
4. Monitoring and assessment of the response of target organism(s).
5. Use of monitoring and assessment information to direct future decision making through the selection of a best model.

The first three components (goals, actions, and models) are largely defined before initiation of an ARM plan, while the latter two (monitoring and directed decision making) comprise an iterative process, whereby each year the predictive ability of models are tested against what was observed during monitoring. This may result in a new best model, greater support for the existing best model, or new models constructed from emerging hypotheses. In this way, habitat management “evolves” as more information about the refuge is gained and uncertainty is reduced.

Development of ARM plans for habitat management will allow the refuge to “learn by doing,” while maintaining a focus on management objectives. Knowledge gained from assessing management actions is considered as integral to the process as the management actions themselves. This emphasis on gaining knowledge about the refuge creates a situation whereby the refuge can refine its habitat management in a feedback between management and assessment. Reducing the uncertainty of habitat management via ARM plans will greatly help the refuge in development of long-term habitat management plans.

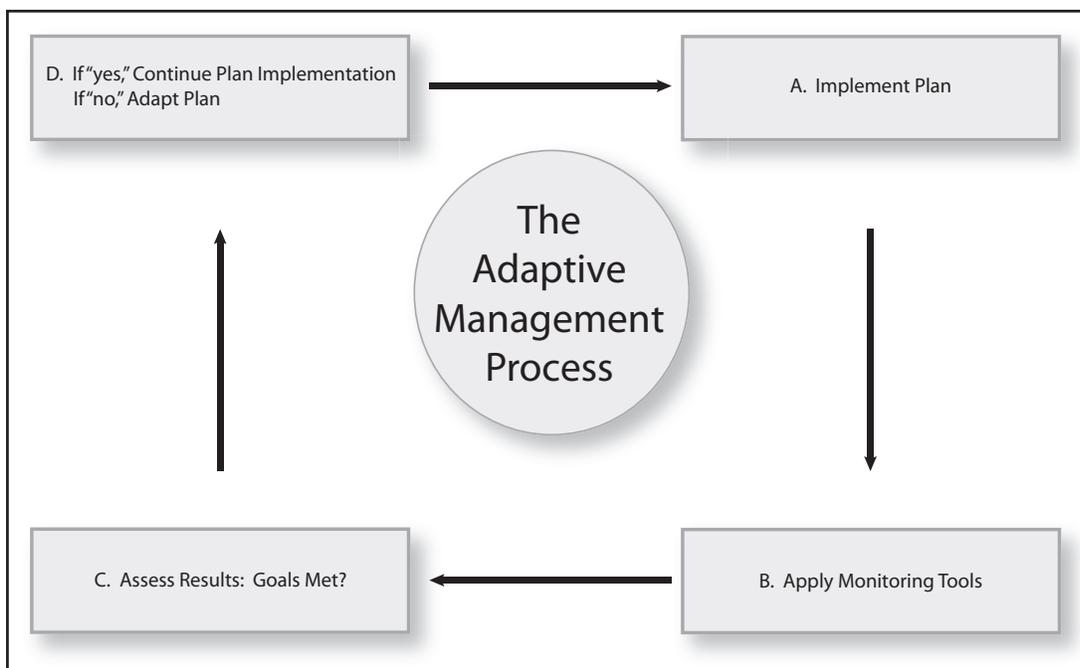


Figure 16. Adaptive management process.

Glossary

accessible—Pertaining to physical access to areas and activities for people of different abilities, especially those with physical impairments.

adaptive resource management—The rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities. It is a process that uses feedback from research, monitoring, and evaluation of management actions to support or modify objectives and strategies at all planning levels. It is also a process in which policy decisions are implemented within a framework of scientifically driven experiments to test predictions and assumptions inherent in management plans. Analysis of results helps managers determine whether current management should continue as is or whether it should be modified to achieve desired conditions.

adfluvial—Dwelling in both rivers and lakes.

Administration Act—National Wildlife Refuge System Administration Act of 1966.

alluvial fan—A sedimentary deposit where a fast-flowing stream has flown into a flatter plain.

alternative—A reasonable way to solve an identified problem or satisfy the stated need (40 CFR 1500.2); one of several different means of accomplishing refuge purposes and goals and contributing to the Refuge System mission (Draft Service Manual 602 FW 1.5).

amphibian—A class of cold-blooded vertebrates that includes frogs, toads, and salamanders.

annual—A plant that flowers and dies within 1 year of germination.

baseline—A set of critical observations, data, or information used for comparison or a control.

biological control—The use of organisms or viruses to control invasive plants or other pests.

biological diversity, also biodiversity—The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (Fish and Wildlife Service Manual 052 FW 1.12B). The National Wildlife Refuge System's focus is on indigenous species, biotic communities, and ecological processes.

biological integrity—Biotic composition, structure, and functioning at genetic, organism, and community

levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.

biotic—Pertaining to life or living organisms; caused, produced by, or comprising living organisms.

blowout—An area denuded of vegetation due to rapid wind erosion.

calcareous—Consisting of or containing calcium carbonate.

canopy—A layer of foliage, generally the uppermost layer, in a vegetative stand; midlevel or understory vegetation in multilayered stands. Canopy closure (also canopy cover) is an estimate of the amount of overhead vegetative cover.

CCP—*See* comprehensive conservation plan.

CFR—*See* Code of Federal Regulations.

cfs—Cubic feet per second.

clonal—A group of genetically identical individuals (e. g., plants, fungi, or bacteria) that have grown in a given location, all originating vegetatively (not sexually) from a single ancestor.

Code of Federal Regulations (CFR)—The codification of the general and permanent rules published in the *Federal Register* by the executive departments and agencies of the federal government. Each volume of the CFR is updated once a calendar year.

compatibility determination—*See* compatible use.

compatible use—A wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the director of the U.S. Fish and Wildlife Service, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge (Draft Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identified stipulations or limits necessary to ensure compatibility.

comprehensive conservation plan (CCP)—A document that describes the desired future conditions of the refuge and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the Refuge System, and to meet other relevant mandates (Draft Service Manual 602 FW 1.5).

concern—*See* issue.

contiguous—An area whose boundaries touch.

cool-season grasses—Grasses that begin growth earlier in the season and often become dormant in the summer. These grasses will germinate at lower temperatures. Examples of cool-season grasses at the refuge are western wheatgrass, needle and thread, and green needlegrass.

cover, also cover type, canopy cover—Present vegetation of an area.

cultural resources—The remains of sites, structures, or objects used by people in the past.

depredation—Destruction or consumption of eggs, broods, or individual wildlife due to a predatory animal; damage inflicted on agricultural crops or ornamental plants by wildlife.

drawdown—The act of manipulating water levels in an impoundment to allow for the natural drying-out cycle of a wetland.

EA—*See* environmental assessment.

ecosystem—A dynamic and interrelating complex of plant and animal communities and their associated nonliving environment; a biological community, together with its environment, functioning as a unit. For administrative purposes, the U.S. Fish and Wildlife Service has designated fifty-three ecosystems covering the United States and its possessions. These ecosystems generally correspond with watershed boundaries, and their sizes and ecological complexity vary.

ecotone—The transition zone between two different plant communities, as that between forest and prairie.

ecotype—A subspecies or race that is especially adapted to a particular set of environmental conditions.

EIS—Environmental impact statement.

emergent—A plant rooted in shallow water and having most of the vegetative growth above water such as cattail and hardstem bulrush.

endangered species, federal—A plant or animal species listed under the Endangered Species Act of 1973, as amended, that is in danger of extinction throughout all or a significant portion of its range.

endangered species, state—A plant or animal species in danger of becoming extinct or extirpated in a particular state within the near future if factors contributing to its decline continue. Populations of these species are at critically low levels or their habitats have been degraded or depleted to a significant degree.

endemic species—Plants or animals that occur naturally in a certain region and whose distribution is relatively limited to a particular locality.

endogenous—growing or developing from within; originating within. Endogenous fat reserves are used for energy during periods of fasting.

environmental assessment (EA)—A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action and alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

environmental health—Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.

eutrophication—Characterized by an abundant accumulation of nutrients that support a dense growth of algae and other organisms, the decay of which depletes the shallow waters of oxygen in summer.

extinction—The complete disappearance of a species from the earth; no longer existing.

extirpation—The extinction of a population; complete eradication of a species within a specified area.

fauna—All the vertebrate and invertebrate animals of an area.

federal trust resource—A trust is something managed by one entity for another who holds the ownership. The Service holds in trust many natural resources for the people of the United States of America as a result of federal acts and treaties. Examples are species listed under the Endangered Species Act, migratory birds protected by international treaties, and native plant or wildlife species found on a national wildlife refuge.

federal trust species—All species where the federal government has primary jurisdiction including federally endangered or threatened species, migratory birds, anadromous fish, and certain marine mammals.

fen—An area of low, flat, marshy land. A fen is fed by surface or ground water and is neutral or alkaline in acidity.

flora—All the plant species of an area.

fluvial—Dwells in rivers or streams.

forb—A broad-leaved herbaceous plant; a seed-producing annual, biennial, or perennial plant that does not develop persistent woody tissue but dies down at the end of the growing season.

fragmentation—The alteration of a large block of habitat that creates isolated patches of the original habitat that are interspersed with a variety of other habitat types; the process of reducing the size and connectivity of habitat patches, making movement of individuals or genetic information between parcels difficult or impossible.

geographic information system—A system that captures, stores, analyzes, and presents locational information.

gleyed soil—Soil that is greenish-gray in color and oxygen-deprived due to high water content.

GIS—*See* geographic information system.

goal—Descriptive, open-ended, and often broad statement of desired future conditions that conveys a purpose but does not define measurable units (Draft Service Manual 620 FW 1.5).

graminoid—Grasses (family *Gramineae* or *Poaceae*) and grasslike plants such as sedges (family *Cyperaceae*) and rushes (family *Juncaceae*).

grassland tract—A contiguous area of grassland without fragmentation.

GS—general schedule (pay rate schedule for certain federal positions).

habitat—Suite of existing environmental conditions required by an organism for survival and reproduction; the place where an organism typically lives and grows.

habitat type, also vegetation type, cover type—A land classification system based on the concept of distinct plant associations.

herbivory—Consumption of vegetation by herbivores; a type of predation.

hummocky—A fertile, wooded area that is slightly elevated from surrounding marshes or swamps.

hypereutrophic—Very nutrient-rich lakes characterized by frequent and severe nuisance algal blooms and low transparency. Hypereutrophic lakes are the most biologically productive lakes, and support large amounts of plants, fish, and other animals. Hypereutrophic lakes have a visibility depth of <3 feet, they have >40 micrograms/liter total chlorophyll and >100 micrograms/liter phosphorus.

Improvement Act—National Wildlife Refuge System Improvement Act of 1997.

indigenous—Originating or occurring naturally in a particular place.

integrated pest management—Methods of managing undesirable species such as invasive plants. Education, prevention, physical or mechanical methods of control, biological control, responsible chemical use, and cultural methods are methods of controlling pests.

introduced species—A species present in an area due to intentional or unintentional escape, release, dissemination, or placement into an ecosystem as a result of human activity.

invasive plant—A species that is nonnative to the ecosystem under consideration and whose introduction

causes, or is likely to cause, economic or environmental harm or harm to human health.

irruptive—not a regular cycle. Species which exhibit irruptive growth are characterized by sharp peaks in population followed by sharp declines. They do not reach a carrying capacity.

issue—Any unsettled matter that requires a management decision; for example, a Service initiative, opportunity, resource management problem, a threat to the resources of the unit, incompatibility of uses, public concern, or the presence of an undesirable resource condition (Draft Service Manual 602 FW 1.5).

lacustrine—Dwells in a lake.

lek—A dancing ground for male sage grouse used to attract breeding females.

macroinvertebrate—An organism that has no backbone, an invertebrate, and is visible without magnification.

management alternative—*See* alternative.

mesic—Of, characterized by, or adapted to a moderately moist habitat.

mesotrophic—Commonly, clear water lakes and ponds with beds of submerged aquatic plants and medium levels of nutrients.

migration—Regular extensive, seasonal movements of birds between their breeding regions and their wintering regions; to pass usually periodically from one region or climate to another for feeding or breeding.

migratory birds—Birds which follow a seasonal movement from their breeding grounds to their wintering grounds. Waterfowl, shorebirds, raptors, and songbirds are all migratory birds.

mission—Succinct statement of purpose and/or reason for being.

mitigation—Measure designed to counteract an environmental impact or to make an impact less severe.

monitoring—The process of collecting information to track changes of selected parameters over time.

montane wetland—the zone directly below the subalpine zone which usually has cooler temperatures and higher rainfall than lower altitude wetlands. The highest zone is alpine, followed by subalpine, then montane, then the foothill zone. Montane wetlands are a type of high-elevation wetland.

national wildlife refuge—A designated area of land, water, or an interest in land or water within the National Wildlife Refuge System, but does not include coordination areas; a complete listing of all units of the Refuge System is in the current “Annual Report

of Lands Under Control of the U.S. Fish and Wildlife Service.”

National Wildlife Refuge System (Refuge System)—Various categories of areas administered by the Secretary of the Interior for the conservation of fish and wildlife, including species threatened with extinction; all lands, waters, and interests therein administered by the Secretary as wildlife refuges; areas for the protection and conservation of fish and wildlife that are threatened with extinction; wildlife ranges; game ranges; wildlife management areas; and waterfowl production areas.

National Wildlife Refuge System Improvement Act of 1997 (Improvement Act)—Sets the mission and the administrative policy for all refuges in the National Wildlife Refuge System; defines a unifying mission for the Refuge System; establishes the legitimacy and appropriateness of the six priority public uses (hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation); establishes a formal process for determining appropriateness and compatibility; establish the responsibilities of the Secretary of the Interior for managing and protecting the Refuge System; requires a comprehensive conservation plan for each refuge by the year 2012. This Act amended portions of the Refuge Recreation Act and National Wildlife Refuge System Administration Act of 1966.

native species—A species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem.

natural processes—a process existing in or produced by nature (rather than by the intent of humans.)

Neotropical migrant—A bird species that breeds north of the United States and Mexican border and winters primarily south of this border.

nest success—The chance that a nest will hatch at least one egg.

nongovernmental organization (NGO)—Any group that is not composed of federal, state, tribal, county, city, town, local, or other governmental entities.

noxious weed—Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the United States, public health, or the environment.

objective—An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work; derived from goals and provides the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated

quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW 1.5).

obligates—Species which must occupy a certain niche or behave in a certain way in order to survive.

oligotrophic—(of a lake) characterized by a low accumulation of dissolved nutrient salts, supporting but a sparse growth of algae and other organisms, and having a high oxygen content owing to the low organic content.

palustrine—Relating to a system of inland, nontidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation (vegetation that is rooted below water but grows above the surface). Palustrine wetlands range from permanently saturated or flooded land, to land that is wet only seasonally.

patch—An area distinct from that around it; an area distinguished from its surroundings by environmental conditions.

pelagic—Open water.

perennial—Lasting or active through the year or through many years; a plant species that has a life span of more than 2 years.

permanent seasonal employee—*See* temporary seasonal employee. A permanent position with benefits, 40 hours per week during the season of employment, usually summer.

persistent emergent vegetation—An emergent plant is one which grows in water but is partly above the surface of the water. Persistent emergent vegetation are plants whose stems remain standing through the winter until the next growing season, e.g. cattails and bulrushes.

plant community—An assemblage of plant species unique in its composition; occurs in particular locations under particular influences; a reflection or integration of the environmental influences on the site such as soil, temperature, elevation, solar radiation, slope, aspect, and rainfall; denotes a general kind of climax plant community, such as ponderosa pine or bunchgrass.

pluvial lake—A lake that experiences significant increase in depth and extent as a result of increased precipitation and reduced evaporation.

prescribed fire—The skillful application of fire to natural fuels under conditions such as weather, fuel moisture, and soil moisture that allow confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of habitat management, wildlife management, or hazard reduction.

priority public use—One of six uses authorized by the National Wildlife Refuge System Improvement Act of 1997 to have priority if found to be compatible

with a refuge's purposes. This includes hunting, fishing, wildlife observation, wildlife photography, environmental education, and interpretation.

proposed action—The alternative proposed to best achieve the purpose, vision, and goals of a refuge; contributes to the Refuge System mission, addresses the significant issues, and is consistent with principles of sound fish and wildlife management.

public—Individuals, organizations, and groups; officials of federal, state, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the core planning team. It includes those who may or may not have indicated an interest in Service issues and those who do or do not realize that Service decisions may affect them.

public involvement or scoping—A process that offers affected and interested individuals and organizations an opportunity to become informed about, and to express their opinions on, Service actions and policies. In the process, these views are studied thoroughly, and thoughtful consideration of public views is given in shaping decisions for refuge management.

purpose of the refuge—The purpose of a refuge is specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing authorization or expanding a refuge, refuge unit, or refuge subunit (Draft Service Manual 602 FW 1.5).

raptor—A carnivorous bird such as a hawk, falcon, or vulture that feeds wholly or chiefly on meat taken by hunting or on carrion (dead carcasses).

refuge purpose—*See* purpose of the refuge.

Refuge System—*See* National Wildlife Refuge System.

refuge use—Any activity on a refuge, except administrative or law enforcement activity, carried out by or under the direction of an authorized Service employee.

resident species—A species inhabiting a given locality throughout the year; nonmigratory species.

rest—Free from biological, mechanical, or chemical manipulation, in reference to refuge lands.

restoration—Management emphasis designed to move ecosystems to desired conditions and processes, such as healthy upland habitats and aquatic systems.

rhizomatous plant—plant that uses rhizomes to reproduce and spread.

rhizome—a rootlike subterranean stem, commonly horizontal in position, that usually produces roots below and sends up shoots progressively from the upper surface.

riparian corridor—An area or habitat that is transitional from terrestrial to aquatic ecosystems

including streams, lakes, wet areas, and adjacent plant communities and their associated soils that have free water at or near the surface; an area whose components are directly or indirectly attributed to the influence of water; of or relating to a river; specifically applied to ecology, “riparian” describes the land immediately adjoining and directly influenced by streams. For example, riparian vegetation includes all plant life growing on the land adjoining a stream and directly influenced by the stream.

scoping—The process of obtaining information from the public for input into the planning process.

sediment—Material deposited by water, wind, and glaciers.

senior water users—water users with a water right that was filed earlier than the Service's.

seral—The series of relatively transitory plant communities that develop during ecological succession from bare ground to climax species.

Service—*See* U.S. Fish and Wildlife Service.

shorebird—Any of a suborder (*Charadrii*) of birds, such as a plover or snipe, that frequent the seashore or mud flat areas.

sodic—Soil containing sodium.

spatial—Relating to, occupying, or having the character of space.

special use permit—A permit for special authorization from the refuge manager required for any refuge service, facility, privilege, or product of the soil provided at refuge expense and not usually available to the general public through authorizations in Title 50 CFR or other public regulations (Refuge Manual 5 RM 17.6).

step-down management plan—A plan that provides the details necessary to carry out management strategies identified in the comprehensive conservation plan (Draft Service Manual 602 FW 1.5).

strategy—A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives (Draft Service Manual 602 FW 1.5).

subirrigated—Also known as seepage irrigation, where water is delivered to the root from below the soil surface.

temporal—Of or relating to time.

temporary seasonal employee—*See* permanent seasonal employee. A temporary position without benefits, 40 hours per week during the season of employment, usually summer. The position will be reopened for candidates each year.

threatened species, federal—Species listed under the Endangered Species Act of 1973, as amended, that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

threatened species, state—A plant or animal species likely to become endangered in a particular state within the near future if factors contributing to population decline or habitat degradation or loss continue.

trust resource—*See* federal trust resource.

trust species—*See* federal trust species.

U.S. Fish and Wildlife Service (Service, USFWS, FWS)—The principal federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. The Service manages the 93 million acre National Wildlife Refuge System comprised of more than 530 national wildlife refuges and thousands of waterfowl production areas. It also operates sixty-five national fish hatcheries and seventy-eight ecological service field stations. The agency enforces federal wildlife laws, manages migratory bird populations, restores national significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the federal aid program that distributes millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

USFWS—*See* U.S. Fish and Wildlife Service.

U.S. Geological Survey (USGS)—A federal agency whose mission is to provide reliable scientific information to describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

USGS—*See* U.S. Geological Survey.

ungulate—a hoofed mammal.

vegetation alliance—A physiognomically (pertaining to physical features, character, or appearance) uniform group of vegetation associations sharing one or more diagnostic (dominant, differential, indicator, or character) species that, as a rule, are found in the uppermost stratum of the vegetation. This is the second finest level in the National Vegetation Classification Standard hierarchy.

vision statement—A concise statement of the desired future condition of the planning unit, based primarily on the Refuge System mission, specific refuge purposes, and other relevant mandates (Draft Service Manual 602 FW 1.5).

visual obstruction—Pertaining to the density of a plant community; the height of vegetation that blocks the view of predators and conspecifics to a nest.

visual obstruction reading (VOR)—A method of visually quantifying vegetative structure and composition.

VOR—*See* visual obstruction reading.

wading birds—Birds having long legs that enable them to wade in shallow water; includes egrets, great blue herons, black-crowned night-herons, and bitterns.

waterbird—Birds dependent upon aquatic habitats to complete portions of their life cycles (for example, breeding).

waterfowl—A category of birds that includes ducks, geese, and swans.

watershed—The region draining into a river, a river system, or a body of water.

wetland management district (WMD)—Land that the Refuge System acquires with Federal Duck Stamp money for restoration and management, primarily as prairie wetland habitat critical to waterfowl and other wetland birds.

WG—wage grade schedule (pay rate schedule for certain federal positions).

wildland fire—A free-burning fire requiring a suppression response; all fire other than prescribed fire that occurs on wildlands (Service Manual 621 FW 1.7).

wildlife-dependent recreational use—Use of a refuge involving hunting, fishing, wildlife observation, wildlife photography, environmental education, or interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority public uses of the Refuge System.

WMD—*See* wetland management district.

woodland—Open stands of trees with crowns not usually touching, generally forming 25%–60% cover.

WPA—Works Progress Administration or Waterfowl Production Area.

WUI—wildland–urban interface.

Appendix A

Public Involvement

A notice of intent (NOI) to prepare the draft comprehensive conservation plan (CCP) and environmental assessment (EA) was published in the *Federal Register* on June 12, 2006. A mailing list of more than 250 names was compiled during preplanning; the list includes private citizens; local, regional, and state government representatives and legislators; other federal agencies; and interested organizations. Public scoping began immediately after publication of the NOI and was announced through news releases and issuance of the first planning update in July 2006. Information was provided on the history of the refuge and the CCP process, along with an invitation to public scoping meetings. These meetings were also announced through the local and statewide media. Each planning update included a comment form as a tool for the public to provide written comments. Any form of written comments were accepted, including emails to the refuge's email address, redrocks@fws.gov.

Three public scoping meetings were held within a 2-hour drive of the refuge office. There were over thirty-five attendees, primarily local citizens and surrounding ranchers. Following a presentation about the refuge and an overview of the CCP and NEPA processes, attendees were encouraged to ask questions and offer comments. Verbal comments were recorded and each attendee was given a comment form to submit additional thoughts or questions in writing.

All written comments were due by September 15, 2006. A total of fifty-five additional written comments were received throughout the scoping process. All comments were shared with the planning team and considered throughout the planning process.

The draft CCP and EA were released to the public on September 26, 2008 through a notice of availability published in the *Federal Register*. Copies of the draft CCP and EA and/or a planning update were mailed to individuals on the planning mailing list. Initially the public was offered a 30-day review period. Numerous requests from the public and state representatives resulted in an additional 30 days being granted, for a full 60-day review. All comments needed to be received or postmarked by November 26, 2008. Two public meetings were held first on October 8, 2008 in Lima, Montana and again on October 9, 2008 in Dillon, Montana. These

meetings were announced in the planning update and through the local and statewide media. Over thirty individuals participated in these meetings. A short presentation was given on the draft CCP followed by an opportunity for participants to offer comments.

In addition to these public meetings, the planning team received over 100 additional written comments during the public review process. The planning team reviewed all comments received both individually and as a team. Several modifications were made to this final document based on this public review. Responses to substantive comments are summarized in this appendix.

FEDERAL OFFICIALS

U.S. Representative Dennis Rehberg,
Washington DC
Representative Rehberg State Office, Missoula, MT
U.S. Senator Max Baucus, Washington DC
Sen. Baucus's Area Director, Bozeman, MT
U.S. Senator John Tester, Washington DC
Sen. Tester's Area Director, Bozeman, MT

FEDERAL AGENCIES

National Forest Service, Dillon, MT
National Forest Service, Ennis, MT
Bureau of Land Management, Dillon, MT
National Park Service, Yellowstone National Park,
MT and Omaha, NE
Bureau of Reclamation, Dillon, MT
Agricultural Research Service, Dubois, ID
U.S. Geological Service, Fort Collins Science Center,
Fort Collins, CO
U.S. Geological Service, Bozeman, MT

TRIBAL OFFICIALS

Eastern Shoshone Business Council, Ft. Washakie,
WY
Crow Tribe of Indians, Crow Agency, MT
Northern Cheyenne Tribal Council, Lame Deer, MT
Arapaho Business Council, Fort Washakie, WY
Nez Pierce, Lapwai, ID
Confederated Salish and Kootenai, Pablo, MT
Shoshone-Bannock, Fort Hall, ID
Blackfoot Nation, Browning, MT

STATE OFFICIALS

Governor Brian Schweitzer, Helena, MT
Mary Sexton, Office of the Governor, Helena, MT
Representative Diane Rice, Harrison, MT
Representative Bill Tash, Dillon, MT
Representative Debbie Barrett, Dillon, MT
Representative Roger Koopman, Bozeman, MT
Representative John Sinrud, Bozeman, MT
Representative Jack Wells, Bozeman, MT
Senator Gary Perry, Manhattan, MT
Senator Steve Gallus, Butte, MT
Senator Joe Balyeat, Bozeman, MT

STATE AGENCIES

Montana Department of State Lands, Dillon, MT
Montana Fish, Wildlife and Parks, Bozeman, MT
Montana Fish, Wildlife and Parks, West Yellowstone, MT
Montana Fish, Wildlife and Parks, Dillon, MT
Montana Fish, Wildlife and Parks, Sheridan, MT
Montana Fish, Wildlife and Parks, Helena, MT
Montana Department of Environmental Quality, Helena, MT
Harriman State Park, Island Park, ID
Idaho Department of Fish and Game, Boise, ID
Montana Department of Natural Resources and Conservation, Dillon, MT
Montana Historical Society and Preservation Office, Helena, MT

LOCAL GOVERNMENT

Madison County Commissioners, Madison, MT
Gallatin County Commissioners, Belgrade, MT
Beaverhead County Commissioners, Dillon, MT
Beaverhead County Road Department, Dillon, MT
Beaverhead County Weed Coordinator, Dillon, MT
Beaverhead County Planner, Dillon, MT

ORGANIZATIONS

Conservation Endowment Fund, Lima, MT
Greater Yellowstone Coalition, Bozeman, MT
Gallatin Wildlife Association, Bozeman, MT
Centennial Valley Association, Idaho Falls, ID
Henry's Lake Foundation, Island Park, ID
Montana Wildlife Federation, Helena, MT
Montana Audubon, Helena, MT
Greater Yellowstone Coordinating Committee, Bozeman, MT
Wilderness Watch, Missoula, MT
American Wildlands, Missoula, MT and Bozeman, MT
Ducks Unlimited, Memphis, TN and Lincoln, MT

Pintler Audubon Society, Dillon, MT
Wildlife Conservation Society, Bozeman, MT
Defenders of Wildlife, Bozeman and Missoula, MT and Washington DC
Trumpeter Swan Society, Wayan, ID
Sierra Club, San Francisco, CA and Bozeman, MT
The Nature Conservancy, Bozeman, MT
Rocky Mountain Elk Foundation, Missoula, MT
Trout Unlimited, Missoula, MT
Montana Wilderness Association, Dillon, MT
National Wildlife Refuge Association, Washington DC
The Wilderness Society, Washington D.C. and Bozeman, MT
Audubon Society, Washington DC and New York, NY
North American Nature Photography Association, Wheat Ridge, CO
National Wildlife Federation, Reston, VA
National Trappers Association, New Martinsville, WV
Isaac Walton League, Gaithersburg, MD
American Bird Conservancy, The Plains, VA
U.S. Humane Society, Washington DC

UNIVERSITIES, COLLEGES, AND SCHOOLS

Montana Tech, Butte, MT
University of Montana—Western, Dillon, MT
Montana State University, Bozeman, MT

MEDIA

Dillon Tribune, Dillon, MT
Montana Standard, Butte, MT
Bozeman Daily Chronicle, Bozeman, MT
West Yellowstone News, West Yellowstone, MT
KDBM Radio, Dillon, MT
KBOW and KOPR Radio, Butte, MT
KWYS and KEZQ Radio, Idaho Falls, ID
The Missoulian, Missoula, MT
KID Radio, Idaho Falls, ID
KUPI Radio and Sandhills Media, Idaho Falls, ID
The Post Register, Idaho Falls, ID
Rexburg Standard Journal, Rexburg, ID
Idaho State Journal, Pocatello, ID
Dillonite Daily, Dillon, MT

INDIVIDUALS

78 private individuals

PUBLIC COMMENTS

TRUMPETER SWANS

Comment 1: *The current draft appears to seriously downplay the purpose for which the refuge was established in 1935, i.e., to protect the trumpeter swan, and does not address the apparent recent decline in the refuge's population.*

Response 1: The Service is fully aware and supportive of the importance of this refuge to recovery and continued support of trumpeter swans. The trumpeter swan was a catalyst for establishing the refuge along with the abundance of waterfowl that used this complex of wetlands. The draft document did not ignore swan management. They were mentioned throughout the document over fifty times. Nevertheless the writers have included additional information and emphasis on this important refuge species in this final comprehensive conservation plan (CCP). Moreover, data indicate steady growth of trumpeter swan numbers at the refuge, Centennial Valley, and state levels, and not an 'apparent recent decline in the refuge's population' (please see further comments on this point below).

Comment 2: *We encourage continued meetings between staff from Yellowstone National Park, other federal and state agencies, and stakeholders in the tri-state range to pursue a vision and agenda for the cooperative, integrated management of trumpeter swans.*

Response 2: The Service plans to continue to participate in this coordination effort.

Comment 3: *We ask that attention be given to actually improving breeding conditions on the refuge to improve the survival rate and long term outlook for the swan. We believe this charismatic species is important for maintaining biological diversity, posterity of our natural heritage, and public interest in continuation of funding for the refuge*

If managers do not reverse the recent declines in swan nesting and cygnet production at RRLNWR [Red Rock Lakes National Wildlife Refuge], the persistence of nesting trumpeter swans in Yellowstone National Park, and in the entire Greater Yellowstone region, will become much more precarious.

Response 3: The number of nests and cygnets fledged in the Centennial Valley has remained relatively static since 1993 ($\bar{x} = 13.1, \hat{\beta} = 0.00, SE = 0.03, P = 0.98$, and $\bar{x} = 22.1, \hat{\beta} = -0.07, SE = 0.05, P = 0.22$), the first nesting season after the termination of winter feeding. The most notable decline in swan production in the last several decades was associated with management actions in the 1990s intended to expand the winter range of the Rocky Mountain Population of trumpeter swans. Efforts included the

termination of winter feeding at Red Rock Lakes NWR, translocation of >1000 swans from the refuge and Harriman State Park (HSP) to more southerly (or at least areas lower in elevation) wintering areas, and hazing of wintering swans from the refuge and HSP. It was predicted that these management activities would "cause a short-term decline in the Centennial Valley trumpeter swan flock" (USFWS 1992). The effects of these actions were much greater, and have been more persistent, than envisioned. For example, the average number of cygnets fledged in the Centennial Valley during the period 1967–1992 was 55.9 (SE = 8.7), which declined to 21.1 (SE = 3.0) during the last 16 years. However, the population has been recovering during this period—the number of adults has been increasing at an annual average rate of 3.5% (SE = 0.01, $P > 0.01$) in the Centennial Valley since 1993, while the total number of swans increased at an average annual rate of 2.3% (SE = 0.01, $P = 0.05$).

Comment 4: *Our foremost concern is that this draft CCP/EA is fundamentally flawed because it is built upon a false foundation. The draft fails to accurately describe the refuge's Establishment and Acquisition History and identify the purpose for establishing this refuge ... ignored these historic facts and excluded all mention of trumpeter swans.*

Response 4: The planning team is fully aware of the significant role the refuge played in the recovery and continued support of the trumpeter swan. To emphasize this, additional language has been added to the final CCP in the establishment history sections.

THE FINAL CCP

Comment 5: *We are concerned that this draft provides no future management direction for trumpeter swans other than implying that somehow a decision has already been made "in favor of allowing the swans to thrive under mostly natural conditions." This is a particularly inappropriate choice of words, given the serious problems facing nesting trumpeter swans at Red Rock Lakes National Wildlife Refuge and the surrounding region, and their obvious failure to thrive under current management direction.*

Response 5: As mentioned above, the number of trumpeter swans in the Centennial Valley is increasing. Future management of trumpeter swans in the Centennial Valley by the refuge will occur within the framework of the "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans." This plan contains population objectives for the Centennial Valley, and has been added to the final CCP.

Comment 6: *The draft makes no mention of: (1) the importance of cygnet production at RRLNWR to the future viability of the regional nesting population*

including the persistence of nesting trumpeters in Yellowstone National Park, (2) the declines of nesting and cygnet production on the refuge including the total nesting failure in 2008 for the first time in refuge history, or (3) the importance of Culver and MacDonald ponds to provide late winter/early spring pre-breeding forage for local nesting swans.

Response 6: Tri-state area trumpeter swans have exhibited positive growth rates since the termination of winter feeding at both regional and state levels. This has occurred even though there was no apparent trend in cygnet numbers for the region or individual states, excluding Wyoming. Consistent population growth across multiple scales within the tri-state region provides support for the current levels of cygnet production sustaining the “future viability of the regional nesting population.” The refuge will continue to work with Yellowstone National Park, and other partners, to work toward maintaining a viable nesting population in the park.

The poor production observed in 2008 is most likely due to the late spring experienced across much of the tri-state area. For example, significant areas of the refuge lakes were still ice-covered in early May, just prior to the normal peak nest initiation period for swans. The effect of the late spring was evident throughout the tri-state area for swans, with below average number of cygnets produced. Moreover, significant nesting failures are not unprecedented in the Centennial Valley or the refuge. For example, only four cygnets fledged from forty-one nests attempts on the refuge in 1980.

Seemingly extreme variation in annual production is expected in long-lived species in variable environments. Reproduction is considered ‘costly’ to individuals due to the increased mortality risks associated with breeding and caring for young. This results in a trade-off between reproductive effort and adult survival, and suggests that individuals must balance the immediate cost of reproducing in a given year and the probability of future reproductive success. For short-lived bird species this typically results in most, or all, individuals breeding each year regardless of conditions—their chance of surviving to breed again is low, so they have little choice but to breed in an effort to maximize their lifetime reproductive success. They have to put all their proverbial ‘eggs in one basket’. However, in long-lived bird species individuals are likely to survive for multiple breeding seasons. Therefore, they can optimize their lifetime reproductive success by not breeding at all, or abandoning their brood during poor years, surviving to breed in years where the likelihood of fledging young is greater. For trumpeter swans, which can live more than 20 years in the wild, maximum fitness can be achieved by foregoing breeding in a poor year, waiting until better conditions are available to attempt nesting and rearing of young. This is why (1) significant variation

in annual swan production is expected, and (2) excessive focus on parameters of annual production is ultimately unproductive.

For support of the latter point, let’s briefly consider the population dynamics of trumpeter swans in the tri-state area over the last seven decades. Initial conservation efforts beginning around 1935 were very successful in 1) protecting the last known breeding population in the contiguous United States, and 2) expanding that population in the tri-state area to more than 500 individuals by 1951. The tri-state flock remained near this number, with considerable vacillations, until 1993 when 277 swans were found during the fall survey. This was the result of management actions taken to expand the winter range of the Rocky Mountain Population of trumpeter swans in an effort to reduce their susceptibility to winter mortality. During the 5 decades before 1993, the number of swan nests in the Centennial Valley often exceeded 60; the average number of nests in the valley from 1967 to 1992 was 45.1 (SE = 2.4). However, even with this exceptional level of nesting effort in the Centennial Valley alone, the tri-state population remained relatively static, hovering near a mean of 500 individuals for nearly 50 years. Since 1993, the number of swans in the Centennial Valley, and throughout the tri-state area, has been steadily increasing, even at significantly lower nest numbers than occurred before 1993. We therefore believe that the future of swan management in the tri-state is determining what limiting factor(s) have prevented the flock from consistently exceeding the threshold experienced during the latter half of the 1900s, and not through singular focus on productivity parameters for a long-lived species.

If Culver and MacDonald ponds provide important “late winter and early spring pre-breeding forage for local nesting swans” we would expect an increasing level of use of the ponds in March and April, after spring migrants have left the area. Refuge data do not support this supposition—weekly surveys of the ponds indicate static numbers of swans during March, with declining use as soon as other open-water areas are available in the valley.

The refuge is proposing to further investigate the importance of these ponds to pre-breeding swans prior to removal for restoration of Picnic and Elk Springs creeks.

Comment 7: *The plan fails to discuss that managers have considerable control over two factors that can significantly impact swan nesting success and productivity, e.g. management of the Lower Lake water control structure and human disturbance during the nesting and brood rearing periods.*

Response 7: The CCP highlights minimizing disturbance to swans in several areas. Additionally, no changes to current closures for nesting swans on

the primary nesting areas were proposed. Recent efforts to manipulate water levels have demonstrated that managers do not have “considerable control” over Lower Red Rock Lake water levels. Manipulating the water control structure does not change water levels as much as was previously anticipated. The refuge’s ability to manipulate water levels on Lower Lake is limited by the scale of the system, its connectivity within the watershed to Upper Red Rock Lake, and the influence of groundwater dynamics.

Comment 8: *The draft CCP/EA fails to include any goals or objectives pertaining to reversing the declines in nesting pairs and cygnet production and fails to analyze the impacts on trumpeter swans of proposed actions such as the proposed increases in human disturbance from fishermen, photographers, hunters, and increased monitoring; alteration of habitat and loss of swan nesting territories at various wetlands; and the proposed water level management regime.*

Response 8: Future management of trumpeter swans in the Centennial Valley by the refuge will occur within the framework of the “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans.” Population objectives for the Centennial Valley have been added to this final CCP.

Spatial and temporal separation of refuge visitors and nesting swans will be maintained to preclude increased disturbance if visitor use levels increase.

The draft plan recognized that a single created swan nesting territory located along Pintail Ditch will be impacted during drought conditions but would continue to provide nesting habitat during average and above average water years.

Increased monitoring is largely focused on habitats not utilized by swans, e.g., sagebrush-steppe habitat.

The enhancement of wetland productivity through improved water level management would primarily be for the benefit of waterfowl, including trumpeter swans. This was stated in the objectives and rationale statements.

Comment 9: *There is no mention that the trumpeter swan is a Region 6 Focal Species and that there are specific population objectives for the refuge in the “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans” approved by the Flyway Council in July 2008.*

Response 9: Future management of trumpeter swans in the Centennial Valley by the refuge will occur within the framework of the “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans.” Population objectives for the Centennial Valley have been added to this final CCP.

Comment 10: *A revised draft should recognize that simply quoting the generic language from the authorizing authority is often not adequate to identify the specific purpose for which a refuge was established.*

Response 10: The language in the executive orders and establishing legislation are the only legislative purposes for this refuge. Issues at the time of establishment that were the catalyst for establishing a refuge do not have the same weight as these legislative purposes.

Comment 11: *We suggest that the Vision Statement describe a desired future condition in which Red Rock Lakes NWR is a conservation leader in the regional efforts to protect and restore Greater Yellowstone’s nesting trumpeter swans and swan nesting habitat on the refuge managed to improve nesting success and cygnet production. It would also be appropriate to include a desired future condition for other wildlife.*

Response 11: The vision statement is a broad description of the desired conditions for the refuge and its role in protecting and preserving the surrounding Centennial Valley. The intent of the vision statement was never to prioritize for single-species management but rather identify how the refuge can support all migratory and resident wildlife through proper habitat management and protection, including the trumpeter swan. More specifics for target wildlife species have been detailed in the objectives and strategies in chapter 4.

Comment 12: *Additional goals and objectives should be added specific to trumpeter swan management.*

Response 12: Future management of trumpeter swans in the Centennial Valley by the refuge will occur within the framework of the “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans.” A specific objective and set of strategies supporting this CCP have been added to chapter 4. The refuge will continue to work with the broader waterfowl management community to set objectives for trumpeter swan management.

Comment 13: *Expansion of big-game hunting should not be permitted in areas that have been set aside as fall waterfowl feeding sanctuaries. The location of fall sanctuary feeding areas for swans and other waterfowl should be clearly portrayed on refuge use maps.*

Response 13: No waterfowl sanctuaries will be opened to expanded waterfowl hunting opportunities. The only expanded big-game hunting near lands set aside for fall waterfowl sanctuary are Sparrow Pond and Sparrow Slough. These waters have been open to nonconsumptive public recreation for decades without significant disturbance to waterfowl. These areas will still be closed to waterfowl hunting.

Big-game hunting is not expected to cause significant conflict. Most big-game hunters arrive in late October during the general open season. Refuge waters usually freeze in late October, so the birds move to larger bodies of water than Sparrow Pond/Slough. The final maps identify these areas.

Comment 14: *The fall hyperphagia period is very important for trumpeters to gain the energy reserves that will help them survive winter and sanctuary areas that contain high quality food are very important.*

Response 14: The draft and final CCP supports this.

Comment 15: *No actions should be proposed that would eliminate or reduce the suitability of historically productive swan nesting territories.*

Response 15: None of the proposed actions eliminate or reduce the suitability of historically productive swan nesting territories.

Comment 16: *No actions should be proposed that would reduce food resources available to Centennial Valley breeding pairs during the crucial late winter pre-breeding period when pairs gain the nutrient reserves essential for successful nesting. This is of particular concern at spring-fed ponds, such as Culver and MacDonald, where the most important spring food plant, *Elodea canadensis* has been abundant in the past.*

*The spring-fed ponds on the refuge, where ice is thin or non-existent, are extremely important for making *Elodea* available as nesting pairs return to the refuge in late winter/early spring. The proposal to eliminate Culver and Macdonald ponds could therefore have significant adverse impacts on refuge nesting pairs and should be abandoned.*

Response 16: Proposed management of wetlands on the refuge will increase the food resources available to pre-breeding swans. If Culver and MacDonald ponds do provide important late winter/early spring pre-breeding forage for local nesting swans, we would expect an increasing level of use of the ponds in March and April, after spring migrants have left the area. Refuge data do not support this supposition—weekly surveys of the ponds indicate static numbers of swans during March, with declining use as soon as other open-water areas are available in the valley.

We believe that a single study showing that confined adult trumpeter swans preferred waterweed (*Elodea canadensis*) over other aquatic plants offered to them is not enough evidence to make the inference that this plant is “the most important spring food plant” for breeding swans. Studies of wild swans have demonstrated that swans select waterweed proportional to its availability. Moreover, empirical evidence suggests that pre-nesting trumpeter swans prefer pondweeds (*Stuckenia* spp. and *Potamogeton*

spp.), especially sago pondweed (*S. pectinata*), during the late-winter and early spring.

Refuge management is proposing to further investigate the importance of these ponds to pre-breeding swans prior to removal for restoration of Picnic and Elk Springs creeks.

Comment 17: *The draft CCP should clearly recognize the crucial importance of cygnet production to the dispersal of subadults and rebuilding of successful nesting on adjacent portions of the Centennial Valley west of the refuge and in nearby areas of Idaho and Yellowstone National Park.*

Response 17: Evidence supporting the statement that cygnet production on the refuge is of “crucial importance ... to the dispersal of subadults and rebuilding of successful nesting on adjacent portions of the Centennial Valley west of the refuge and in nearby areas of Idaho and Yellowstone National Park” is lacking—please see our comments regarding this topic above.

Comment 18: *Given the great interest in SAV management in the draft, we are quite surprised that the draft CCP/EA does not reference the extensive summary of the refuge’s historic SAV information written for the Service in 1987 by David Paullin, Dr. Oz Garton, and Ruth Shea Gale.*

Response 18: The CCP included a summary of historic SAV information, including David Paullin’s thesis.

Comment 19: *The proposed action promotes destruction of MacDonald and Culver Ponds—ponds which are integral to the historical legacy of the refuge and presently provide one of the last undisturbed winter roosting (habitats) for remaining trumpeter swans and bald eagles. The removal of these ponds is intended to restore stream function, yet the plan concedes that at least one historical trumpeter swan nesting territory will be eliminated.*

Past data on movements of marked refuge trumpeters indicate that local swans would most likely merely be displaced to other nearby heavily used wintering sites in Idaho. There are no data to support the statement that removing this pond habitat would further expand the winter range of the Rocky Mountain Population of trumpeter swans.

Response 19: This document states that removing the ponds will “further efforts to expand the winter range,” not that it will expand the winter range per se. This is consistent with the winter range expansion program that is the top focus of The Trumpeter Swan Society (http://www.trumpeterswansociety.org/at_work.htm).

Comment 20: *Because *Elodea* is highly vulnerable to over-winter mortality, this species’ ability to survive frequent fall-winter draw-downs should*

be thoroughly explored before a strategy involving frequent late-season draw-downs is implemented.

Response 20: ‘Frequent’ late-season drawdowns are not a strategy in the document.

Comment 21: *The draft CCP fails to recognize the ecological importance of the refuge to the Greater Yellowstone Ecosystem (GYE) and to discuss key ecosystem habitat and wildlife population issues that would potentially be impacted by refuge management.*

Response 21: The CCP does recognize the value and importance of the refuge within the GYE. Additional language has also been added to chapter 1.

Comment 22: *Rather than considering the refuge in the context of the GYE, the draft CCP discusses “Ecosystem Description and Threats” in the context of a huge watershed entity (the Upper Missouri-Yellowstone-Upper Columbia River ecosystem), which extends from the Canadian border in northwestern North Dakota to the Continental Divide immediately south of Red Rock Lakes National Wildlife Refuge. This watershed approach has little relevance for migratory bird management. The FWS [U.S. Fish and Wildlife Service] “ecosystem approach” failed and was abandoned, largely for that reason.*

Response 22: Evaluation of the refuge in the context of larger ecosystems identified and described by the Service is a standard part of a CCP. We have added information about the GYE in chapter 1.

Comment 23: *National Wildlife Refuges are supposed to be a “system” of lands, however there is no mention of the relationship of other refuges in the tri-state area that are connected by shared migratory bird resources including trumpeter swans.*

Response 23: The CCP does acknowledge connectivity to other public lands in the surrounding area by supporting national and regional conservation plans such as the “North American Waterfowl Management Plan,” Partners in Flight plans, “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans,” and “Coordinated Implementation Plan for Bird Conservation in Western Montana.”

Comment 24: *There is no discussion of the inter-relationship of other habitat areas managed by agencies, tribes, or private individuals that are collectively important for migratory bird conservation.*

Response 24: In chapter 1 we recognize the importance of several other plans that address nationwide planning efforts and objectives for migratory wildlife species.

Comment 25: *There is no mention of the 2008 Pacific Flyway for Rocky Mountain Population of Trumpeter Swans, the North American Waterfowl Management Plan, the Intermountain West Joint Venture, or the wildlife action plans in the Tri-State area.*

Response 25: These plans were either listed in chapter 1 or have since been added to the final CCP.

Comment 26: *There also appears to have been little or no coordination even with other programs within the FWS.*

Response 26: Refer to the participant list in this appendix. There was extensive collaboration with state and other federal partners, including other Service divisions.

Comment 27: *Trumpeter swans are not at all “thriving” at RRLNWR under current management and they are unlikely to do so in the future without close attention to their habitat needs and active management [of] the refuge.*

Response 27: Consistent population growth rates approaching 4% per year, which is what trumpeter swan populations in the Centennial Valley are achieving, would be considered ‘thriving’ by most wildlife professionals’ standards. For example, the mid-continent population of snow goose reached population levels that exceeded the carrying capacity of their nesting grounds, resulting in considerable efforts to reduce their abundance. This population grew at an average annual rate of 4% prior to management efforts to reduce their numbers. The document does outline management actions for wetland habitats that will support and promote trumpeter swan reproduction and survival.

Comment 28: *The draft CCP/EA fails to include any goals or objectives pertaining to reversing the declines in nesting pairs and cygnet production.*

Response 28: Refuge data do not support this statement that swans are declining. Cygnet production was very low in 2008 at two birds. However, production has been stable over the past five years. The twenty-two young counted in the 2009 survey was not significantly below the average of 25.4. The number of nesting pairs is stable.

ARCTIC GRAYLING

Comment 29: *The preferred alternative should include stronger language designed to achieve its fisheries objective.*

Response 29: If greater specificity in the objective is what is meant by ‘stronger language’ then the step-down Habitat Management Plan, to be completed once this CCP is finalized, will address this concern. Specific objectives for Arctic grayling were added.

Comment 30: *Specific time frames (within 2 years, etc.) seem to be missing from the major fisheries objectives. “Within 15 years” is too weak.*

Response 30: A longer time period will be necessary to accomplish fisheries objectives due to the need to ensure minimum or no effect on other wildlife, especially trumpeter swans.

Comment 31: *“Description of Consequences by Resource” (p. 92 draft CCP) states “The environmental consequences discussed in this chapter are the potential effects on a resource as a result of carrying out the actions of an alternative.” How then can each alternatives narrative on Habitat and Wildlife concerning the Lower Lake, lack a discussion of an actions effect on this lake’s fishery resource and in particular on Arctic grayling?*

Response 31: Existing data (for example, Nelson 1953, USFWS unpublished data) demonstrate very limited use of Lower Red Rock Lake by Arctic grayling. Additionally, the time period where Lower Lake can provide grayling habitat is limited due to the lake freezing to the substrate in the winter and exceeding temperatures lethal to grayling during the summer.

Comment 32: *Lowering Lower Lake would provide opportunity for waterfowl habitat; however, it could have significant impact on the native population of Arctic grayling that use Lower Lake and Odell Creek.*

Response 32: Existing data (for example, Nelson 1953, USFWS unpublished data) demonstrate very limited use of Lower Red Rock Lake by Arctic grayling thereby limiting the probability of a ‘significant impact’ to the population.

Comment 33: *Management actions pertaining to Lower Lake /River Marsh sections simply relate to aquatic vegetation and waterfowl. I wonder why this document failed to address the possible effects that manipulating water levels may have on this lake’s fish community.*

Response 33: The refuge and the lake are managed for waterfowl and waterbirds, following the purpose for the refuge. There may be impacts to the burbot population, but these impacts are uncertain.

Comment 34: *Address the environmental consequences that actions contained in the proposed action may have during Arctic grayling migrations through the Lower Lake and River Marsh.*

Response 34: Migrations of Arctic grayling through River Marsh and Lower Lake will be minimally effected by the proposed action. While dependent upon runoff, spring (pre-spawning) and early summer (post-spawning) water levels will continue to provide deep water corridors for fish movement. It is important to note that this population of Arctic grayling evolved without dams and water control

structures obstructing fish passage, and that the population decline of grayling has been concurrent with habitat changes over the last century, including the placing of a water control structure on Lower Lake.

Comment 35: *By omitting fisheries information from this document, does one assume that the Service has written off grayling in this area of the refuge and written off the value the Lower Lake/River Marsh has to the grayling population as a whole in the system?*

Response 35: Current data do not demonstrate that Lower Red Rock Lake and River Marsh provide critical habitat for Arctic grayling. These water bodies are critical to waterfowl, including trumpeter swans.

Comment 36: *The CCP covers only native Arctic grayling. Is that the only native sport fish in the lakes?*

Response 36: Grayling and mountain whitefish are the only native game fish present on the refuge. Native Westslope cutthroat trout only exist as hybridized fish with nonnative Yellowstone cutthroat and rainbow trout. The CCP does recognize these other native fish in the plan, but none are as imperiled as grayling.

Comment 37: *As for nonnative fish present in the lakes, it is not clear what species they are nor what method would be used to eradicate them as proposed.*

Response 37: Nonnative Yellowstone cutthroat, rainbow, and brook trout all probably utilize Upper and Lower Red Rock Lakes to some extent but Lower Lake is very shallow and temperatures are too high in the summer for trout. As grayling restoration work continues, the refuge will work closely with fisheries biologists to develop methods to reduce the nonnative fish species.

Comment 38: *We were troubled by the fact that the plan focused on Arctic grayling as the main species it will manage and restore riparian habitat for. We would like to see how it will consider species of conservation concern (Montana Natural Heritage Program) other than Arctic grayling in management decision[s]—and how management conflicts will be dealt with, if they exist.*

Response 38: We do not feel that the document focused on Arctic grayling. Dozens of other species of wildlife were mentioned and discussed; however, the document does recognize that the refuge has one of the last endemic populations of adfluvial Arctic grayling in the continental United States and are a state species of concern. It is the Service’s responsibility to ensure that species of concern do not become threatened or endangered. The most significant management actions are focused on

waterfowl and other migratory birds, the purposes for which this refuge was established.

Comment 39: *I doubt that the grayling are severely affected by the presence of Culver and McDonald ponds and there are other strategies that would benefit them far more than the draining of these two ponds. I would not drain them as they have a historic value and are used extensively by wildlife.*

Response 39: Culver and McDonald ponds are artificial ponds caused by the damming of streams that were historically used by spawning Arctic grayling. The majority of modified or created refuge ponds will remain intact for migratory birds and other wildlife.

Comment 40: *I support alternative B for stream corridors but would go so far as to say that there should be consideration of the expansion of the refuge to encompass the upstream areas that have grazing practices that are harmful to the refuge.*

Response 40: The refuge will continue to work with upstream landowners to reduce off-site impacts to refuge waters—a program that has been successful in the past.

WETLANDS

Comment 41: *What criteria was used to classify Lower Lake as its own entity and not include it in sections discussion of ‘natural lakes’ or ‘modified wetlands’? On p. 23 (draft CCP), the Lower Lake and River Marsh are described as being influenced by a series of water control structures.*

Response 41: Scale, connectivity with the other lakes, and ability to manipulate water levels were considered when separating Lower Red Rock Lake and River Marsh from ‘natural lakes’ and ‘modified wetlands’. While the outflow of Lower Lake has a water control structure on it, the ability to manipulate water levels is not as great as on smaller modified wetlands. This is due in part to the size of the Lower Lake and River Marsh area, its connectivity to Upper Red Rock Lake, and the influence of groundwater moving through the system.

Comment 42: *The proposed action of not diverting water to some units unless the snowpack exceeds the 30 year high could result in the loss of water rights. I didn’t see that issue discussed.*

Response 42: The Federal Reserved Water Right (1999) compact protects the refuge’s water right for the purposes of the refuge including wildlife habitat maintenance and enhancement. The proposed actions fulfill the purposes of the refuge.

Comment 43: *The preferred alternative briefly describes significantly changing water management on the refuge, but doesn’t adequately discuss the*

how this will benefit the original purpose of the refuge. The CCP doesn’t address any changes on downstream habitats and water users.

Response 43: The water management is not ‘significantly’ different but the rationale in chapter 4 does explain the benefits of the objectives and strategies and includes monitoring of the effects on downstream users.

Comment 44: *The purpose of encouraging waterfowl to migrate to historical wintering areas may be successful for certain species, but it is not guaranteed.*

Response 44: We concur and were careful to use ‘encourage’ in our statement due to these uncertainties.

Comment 45: *Culver and MacDonald ponds should not be restored to natural streams.*

Response 45: Arctic grayling are a species of concern in Montana. Grayling spawning habitat was eliminated by the damming of two streams to create Culver and MacDonald ponds. Restoration of these streams will provide the opportunity to more than double the number of creeks used by spawning grayling in the Centennial Valley. The refuge will still have thousands of acres of wetlands that will provide productive habitat for trumpeter swans and other migratory birds and resident wildlife.

Comment 46: *Since 1988, FWS has never had a coherent plan for using the water control structure on the Lower Lake. Now, FWS proposes to open the gates permanently – except for “ecological experiments” and allow “a naturally fluctuating hydrological cycle.” The plan does not analyze the impact of this proposal on waterfowl hunting.*

Response 46: A memorandum of understanding (MOU) with the local water-user’s group was signed February 4, 1987, providing a “coherent plan” for the management of the Lower Red Rock Lake water control structure. The foundation of management set forth by the MOU was built upon in 2004 with an adaptive management plan intended to increase the productivity of the wetland impacted by the water-control structure. The purpose of the ecological experiments is to improve the understanding and management of the WCS and surrounding hydrological system, including its effects on waterfowl. The refuge presented this CCP to, and received comments from, duck hunters, Montana Fish, Wildlife and Parks, and conservation organizations including Ducks Unlimited, Inc, and The Trumpeter Swan Society. Copies of these, and other management plans, can be obtained from the refuge.

Comment 47: *Lower water levels do not provide access into River Marsh, an area that has been*

waterfowl hunted for over 100 years. The Service needs to disclose these impacts and estimate how many years hunting by boat will be impossible or nearly impossible.

Response 47: Refuge staff regularly accesses River Marsh at the water levels claimed to exclude duck hunting. Also, fall water levels will be maintained at the refuge's current legal right, excluding years when a drawdown is scheduled.

Comment 48: *There is no question that many more swan nested on the refuge when water levels on Lower Lake were kept at a higher level. Altering water levels would give the refuge an opportunity to observe how different water levels on the lake might influence water use in the various seasons.*

Response 48: The reduction of nesting swans in recent history is the result of efforts to expand the winter range of the Rocky Mountain Population of trumpeter swans. This occurred in 1992–93, over a decade prior to the water levels being lowered on Lower Red Rock Lake.

Comment 49: *Consideration should be given to a late summer increase in lake elevations through a reduction in Lower Lake outflows—enhancing migrating and staging habitat for waterfowl and providing better distribution of waterfowl during hunting season.*

It's time to stop treating water management of Lower Lake as an ecological experiment that changes with each generation of managers and biologists. Adopt a management scheme that seeks to replicate conditions created at the lake 1930–88 offering greater public opportunity and staging areas for waterfowl. At a minimum, we believe water levels should be raised to provide safe, reasonable public access during waterfowl hunting season.

Response 49: The refuge will work within the existing memorandum of understanding with the local water-users group to provide enhanced staging and migrating habitat in the late summer and fall for waterfowl. This will be largely accomplished by maintaining water levels at the refuge's current legal water right during the fall, excluding years when a drawdown is scheduled.

Comment 50: *The system of ditches and headgates associated with Odell Creek appears to allow useful irrigation of meadows and pastures which enhances wildlife habitat and waterfowl nesting habitat. I see no reason to retire them.*

Response 50: We believe the costs associated with diverting water from Odell Creek do not outweigh the benefits. There are greater than 7000 acres of naturally occurring wet meadow habitat on the refuge, similar to what could be created by irrigating 'meadows and pastures' by diverting Odell Creek. However, Odell Creek is one of only two creeks that

support spawning grayling in the Centennial Valley. Therefore, we believe the most beneficial use of Odell Creek water is for instream flow to benefit Arctic grayling.

Comment 51: *Culver and MacDonald ponds are historic pieces of the valley and serve a purpose that was well thought out 75 years ago. Removal of historic structures should require an EIS.*

Response 51: The historical significance of these water control structures was investigated and found to not be of historical significance by the Montana state historic preservation officer (July 22, 2009).

Comment 52: *Consider operating the water control structure on Lower Lake at 6608 msl in September and October to accommodate boater use. The proposed alternative proposes opening all the gates so to provide for a naturally fluctuating hydrological cycle. The failure to consider operating the WCS so as to provide more water is inconsistent with the management history of Red Rock Lakes National Wildlife Refuge and fails to provide reasonable recreational access to the Lower Lake and River Marsh.*

Response 52: The refuge will maintain Lower Red Rock Lake water levels during the fall, within the constraints imposed by climatic variability and the existing water-control structure, at 6607.5 feet above mean sea level (msl). Periodic (every 4–7 years) drawdowns of Lower Lake to increase the productivity of the wetland system will be the exception to this. Maintaining Lower Lake water levels at 6607.5 msl, the refuge's legal water right, will provide increased habitat for staging and migratory waterfowl. The current strategy of leaving the water control structure open will continue during the spring and early summer for the benefit of nesting trumpeter swans and other waterfowl.

Comment 53: *Converting Culver and MacDonald ponds is detrimental to waterfowl winter habitat, including swans. The refuge has been vital to swans and should continue to be.*

Response 53: We believe that the presence of winter habitat on the refuge is detrimental to trumpeter swans and therefore believe removal of the ponds will ultimately benefit this population.

Comment 54: *There must be recognition that, even in this isolated area, the ecosystem and natural processes have been significantly altered by human activities. A "hands off" approach is a recipe for further deterioration of habitats and the populations of migratory birds that depend on them.*

Response 54: This CCP clearly recognize that the refuge has been altered by human activities and that active management, such as managing water levels and controlling invasive species, is important

to properly manage this refuge. Nevertheless, there are areas that are still intact and functioning much as they did prior to settlement in this valley. These areas will be monitored and maintained to protect their integrity.

Comment 55: *Because Elodea is highly vulnerable to over-winter mortality, this species' ability to survive frequent fall-winter draw-downs should be thoroughly explored before a strategy involving frequent late-season draw-downs is implemented.*

Response 55: Frequent late-season drawdowns are not a strategy in the document.

ALTERNATIVES/CONSEQUENCES

Comment 56: *We strongly believe that the complex issues involving numerous threatened, endangered and/or species of concern and the equally complex inter-relationships of the management options involving the critical wetlands and uplands of the refuge, compel the preparation of a comprehensive Environmental Impact Statement. We urge the Service to maintain the status quo of the refuge (identified as alternative A) unless and until such a comprehensive EIS is completed and the full NEPA process is followed.*

Response 56: The preferred alternative is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)C of the National Environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement is not warranted. The issues identified in this document are not significant, nor are the proposed changes to the management of the refuge. There are no known endangered or threatened species that regularly use the refuge.

Comment 57: *The preparation of a comprehensive Environmental Impact Statement (EIS) would certainly be in the best interests of all concerned. The additional time necessary to prepare the EIS will pay huge dividends in determining and understanding the exact long term, potentially devastating impact expanding the hunting privileges will have on this magnificent area.*

Response 57: Hunting is a compatible, traditional public use of this refuge and the refuge system as a whole. The expanded hunting opportunities should not detract from the purpose for which this refuge was established and will be monitored and modified to ensure these hunts are ethical, safe, and meet the desired objectives.

Comment 58: *Although the analysis of environmental consequences contains a section entitled "Habitat and Wildlife," only habitat is discussed; there is no mention of impacts on wildlife species, populations, or species groupings.*

Response 58: Impacts on wildlife species and species groupings are provided throughout chapter 5's "Habitat and Wildlife" section of the draft CCP. Additional impacts have also been added to the final CCP.

LANDSCAPE PERSPECTIVE

Comment 59: *The draft CCP/EA completely whites-out all adjacent portions of Idaho and omits them from all discussion, as if an ecological wall existed along the Idaho/Montana state line. This likely has more to do with the fact that the state line forms the Region 6–Region 1 administrative boundary than with any ecosystem context for refuge management. This section should be completely rewritten.*

Response 59: The Service and the refuge has and will continue to work with it's partners in Idaho and other bordering states in managing migratory wildlife, including trumpeter swans. This CCP considered the refuge in the context of the Upper Missouri, Yellowstone, and Upper Columbia Rivers Ecosystem and includes partnering across state lines to achieve common goals for migratory wildlife species.

We added a description of the GYE as well, which includes Idaho.

Comment 60: *I think it is important to look at the refuge in the context of the whole Centennial Valley. Wildlife conservation on the refuge will depend, to a significant extent, on habitat quality in other parts of the valley. This means outreach to private landowners downstream and especially upstream of the refuge in addition to working with state and federal agencies. This means greater emphasis on restoration.*

We encourage the refuge staff and the USFWS [U.S. Fish and Wildlife Service] to deepen its relationships with private landowners in the Centennial Valley, specifically with the Centennial Valley Association. We also encourage the USFWS to continue its good work with other agencies such as the U.S. Forest Service, Bureau of Land Management and the State of Montana to ensure the valley is managed in a holistic manner.

Response 60: This document did attempt to consider the Centennial Valley as a whole and its impacts on the refuge. We do realize that the refuge is not an island. Such programs, such as the conservation easement program, have been successful in protecting private lands while maintaining a working landscape. The refuge will continue to work with surrounding landowners and other partners to achieve common goals and protect this unique resource.

Comment 61: *There was no discussion of how the refuge fits in with surrounding protected areas and*

the Pacific Flyway? How does it fit into the Greater Yellowstone Ecosystem? Does it have a role in the grizzly bear or wolf recovery plans?

Response 61: The document does discuss national, state, and regional plans in which the refuge has a role to play. The refuge currently does not participate in any wolf or bear recovery plans.

Comment 62: *We urge the refuge to work with adjacent landowners to achieve wildlife connectivity across the entire landscape.*

Response 62: The refuge's conservation easement and fee title program focus on achieving this goal. For example, through these programs a continuous connection on the east end of the valley has been created from the BLM to the south across the valley to U.S. Forest Service (USFS) land to the north (see figure 6, conservation easement map).

Comment 63: *The plan fails to recognize the ecological importance of Red Rock Lakes in the larger conservation landscape, namely the Greater Yellowstone Ecosystem and the Pacific Flyway and to discuss key ecosystem habitat and wildlife population issues that would potentially be impacted by refuge management.*

Response 63: The CCP does recognize the value and importance of the refuge within the GYE.

Comment 64: *There is no discussion of existing management, conservation projects, or research conducted by BLM [Bureau of Land Management], USFS, or private lands in the valley by organizations such as Wildlife Conservation Society or American Wildlands. How will the refuge collaborate in those activities outside the refuge boundaries?*

Response 64: The refuge has a long history of working with neighboring landowners and other partners interested in conserving the Centennial Valley. This document supports maintaining and expanding those efforts.

Comment 65: *The CCP does not address the refuge's importance as a regional link in providing habitat connectivity between the GYE and core habitats further west.*

Response 65: This document does recognize that the refuge is an important link between the GYE and the Bitterroot ecosystems.

Comment 66: *We are unclear from reading the plan how many of these inholdings are within the refuge. Any work to secure easements or fee title to inholdings should be given a priority, simplifying management and protecting wildlife.*

Response 66: The maps do depict all refuge inholdings. The refuge has worked through fee title and the

conservation easement program to acquire many of these lands or ensure they do not become developed.

Comment 67: *The plan indicated that tree densities have increased and forests have expanded into the adjacent sagebrush/grassland habitat due to grazing. Because sagebrush is rare, it seems important to reverse this trend.*

Response 67: This issue is at a landscape scale in the valley with limited acres impacted on the refuge. The refuge is working with the BLM and other interested partners to address this.

Comment 68: *The Service needs to assess the implications of climate change on all the alternatives in the plan. Be proactive in developing management alternatives that account for climate change in management objectives and strategies.*

The CCP should consider the effects of climate change and how the refuge can help adapt to mitigate wildlife impacts. The anticipated effects of climate change and prudent management responses should be carefully considered and described during the CCP process.

Response 68: The document does discuss some of the effects global warming has had on the refuge and did consider climate change in making management decisions. Climate change will be further considered in the step-down management plans, which can be readily adjusted to address changing conditions. Also, addressing climate change in these documents is evolving as more information is gained.

The document recognizes climate change as having an effect on refuge habitats, including more frequent droughts causing a loss of wetland habitat. We also modified the CCP to keep Lower Lake dam in place to provide greater management flexibility if droughts become more frequent and severe. Through the conservation easement program the Service can maintain key corridors for wildlife migration and allow them to adjust to habitat changes caused by global warming.

Comment 69: *Sagebrush-steppe habitat is expected to disappear if global warming continues. The refuge needs to take a proactive approach and identify specific climate change and formulate appropriate management strategies.*

Response 69: This is a 15-year document and it is not probable that the refuge will lose sagebrush-steppe habitat during this time period.

Comment 70: *Focus on managing the refuge to maintain and enhance wildlife connectivity for wide-ranging species, toward re-connecting partially or wholly disjunct wildlife populations in Greater Yellowstone to outside populations in Idaho and beyond.*

Response 70: This document enhances the refuge's ability to maintain its role as a migratory corridor for various wildlife species.

Comment 71: *There is no discussion of the inter-relationship of other habitat areas managed by agencies, tribes, or private individuals that are collectively important for migratory bird conservation.*

Response 71: In chapter 1 we recognize the importance of several other plans that address nation wide planning efforts and objectives for migratory wildlife species.

Comment 72: *There is no mention of the "2008 Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans," the North American Waterfowl Management Plan, the Intermountain West Joint Venture, or the wildlife action plans in the Tri-State area.*

Response 72: See chapter 1 for a description of these plans.

Comment 73: *There appears to have been little or no coordination even with other programs within the FWS.*

Response 73: Refer to the participant list in this appendix. There was extensive collaboration with state and other federal partners.

INVASIVE SPECIES

Comment 74: *The discussion of invasive weeds is inadequate. The primary species mentioned are Kentucky bluegrass and other nonspecified nonnative rhizomatous grasses. Are there no state listed noxious weeds present on the refuge? If there are, how are they controlled? This lack of specificity should be replaced with concise detection and control practices with as much detail as possible.*

Response 74: There is considerable discussion on invasive species and a commitment for control and eradication. This is a broad management document. A 5 year step-down Integrated Pest Management Plan will be completed, providing greater detail on specific species and treatments.

Comment 75: *By reducing/destroying the brome grass, you are also destroying part of history. Early settlers toiled and labored intensely to farm and establish these areas. Management has yet to prove they have found an optimal way of reducing it.*

Response 75: We agree that it is difficult to control this species, nevertheless, the Service is required by policy to control invasive species, including brome grass. This grass outcompetes more desirable native plants that have a greater benefit to a variety of wildlife species, both nutritionally and structurally.

The refuge will not be able to eradicate smooth brome. Viable methods of control will be developed for this high mountain valley. Potential goals would be to contain the spread of satellite populations into native vegetation and to reduce the cover of brome within formerly plowed areas while reseeding native plants.

OTHER WILDLIFE

Comment 76: *Alternative A contains no population size of the potential species affected, nor do the other alternatives. The word 'management' implies the need to specify numbers in proposing changes.*

Response 76: It is difficult to accurately predict how migratory populations of wildlife within the boundaries of a 49,000 acre refuge boundary will respond to management actions. Outside influences, such as impacts to surrounding habitats, climate change, and changes in land use all affect populations on the refuge, regardless of how well the refuge is managed. Monitoring wildlife response to management actions often requires a broader, landscape perspective. To do this, the CCP supports, and works toward habitat objectives, outlined in landscape level plans such as the "North American Waterfowl Management Plan" and "Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans."

Comment 77: *The CCP provides no discussion of how the refuge will support resident grizzly bear, wolverine, and wolves other than a discussion on predated wolves.*

Response 77: These wildlife species use the refuge infrequently; however, more detail will be provided in a step-down habitat and wildlife management plan.

Comment 78: *The refuge hosts substantial seasonal use by antelope, elk, and moose but does not discuss how that use fits into the larger landscape of adjoining lands in the Centennial Valley, southwestern Montana or southeastern Idaho.*

Response 78: These are state managed species and we will continue to manage them in coordination with the state.

Comment 79: *How are seasonal concentrations of big game on the refuge influenced by human activities and habitat conditions elsewhere?*

Response 79: Hunting on surrounding lands has created concentrations of elk in refuge no-hunting areas in the fall. This impacts refuge habitats and is counterproductive to the state's objective of reducing the number of elk residing in the valley.

Comment 80: *The key to successful preservation of wilderness values, and in managing surrounding landscapes to help preserve that character, is for*

management to exercise restraint and to minimize physical facilities, motorized travel, and avoid increasing human disturbance in areas where wildlife finds security.

Response 80: We agree and this CCP minimizes motorized access and development of facilities for the majority of the refuge, in particular Red Rock Lakes Wilderness, which makes up 66% of the refuge.

Comment 81: *We assume species of conservation concern will receive more attention than other species. This needs to be spelled out more clearly in this document.*

Response 81: This CCP identifies several target species, many of which are species of concern in Montana, which the Service will use to manage habitat and gauge response.

Comment 82: *Due to the close proximity to the St. Anthony Sand Dunes it is probable that the St. Anthony Dune Tiger Beetle (*Cicindela arenicola*) occurs on Red Rock Lakes National Wildlife Refuge. It is listed as G1/G2 (highly imperiled/imperiled) status by NatureServe. You may wish to consider this in your priority setting and subsequent management plan.*

Response 82: This beetle has not been documented on the refuge.

Comment 83: *Numerical survey data for both the Brewer's sparrow and swan document numbers that exceed threshold values to classify the refuge as IBA. Although the trumpeter swan information is contained on page 86 (draft CCP), the Brewer's sparrow information is missing. (p 101 EC) (draft CCP)*

Response 83: BirdLife International recently down-listed Brewer's sparrow so it is no longer a high-priority species for IBAs. They are therefore no longer considered for IBA recognition at the contiguous or global scale. They are still a species of concern at the state level, but we are unaware of threshold values for state IBAs.

Comment 84: *The plan should evaluate existing endangered and candidate species on the refuge and outline a management plan that will ensure the health and recovery of these populations.*

Response 84: Currently there are no threatened or endangered species using this refuge on a regular basis.

Comment 85: *Focus on restoring native and migratory wildlife species within or near Red Rock Lakes currently in decline, including Arctic grayling, Westslope cutthroat trout, and bighorn sheep.*

Response 85: There are no bighorn sheep on the refuge and we have addressed these fish species.

Comment 86: *Employ only nonlethal means to prevent and resolve livestock conflicts with wolves and other predatory wildlife.*

Response 86: If at all possible, nonlethal means will be used to resolve livestock conflicts. Language has been added to this strategy in chapter 4.

Comment 87: *RRL is one of the few refuges of a significant size to allow bison to recover and thrive. Three-wire high tensile electrified fence would contain bison.*

Response 87: The service has extensive experience with fencing of American bison and three wire high tensile has not been found to be adequate. The Service is not willing to accept periodic escape and the consequences that would result. Secondly, there is significant migration in and out of the refuge by elk, moose, pronghorn, and deer. A bison fence would conflict with that migration. The service will not reintroduce bison that require any significant fencing.

Comment 88: *The refuge should be prepared to host wild migrating bison that may emerge from the Greater Yellowstone area.*

Response 88: If a population does migrate and reside in the valley, the refuge will address this along with other partners in the valley.

Comment 89: *More specifics need to be added to the draft plan. For example the plan states wolves and bison would be managed, but it doesn't say how or at what levels. That leaves important issues such as these open to the theology and philosophies of the manager, and in turn lends to potentially inconsistent practices as managers come and go.*

Response 89: This is a broad management plan. There will be additional specifics in step-down wildlife management plans, available for public review, that will be revised approximately every one to five years.

Comment 90: *I am not in favor of bison on the refuge due to disease impacts to cattle and the need for a fence, impeding wildlife movements.*

Response 90: This CCP does not propose reintroducing fenced bison on to the refuge.

Comment 91: *Wolves have increased beyond established goals. The refuge should not be a safe house for them to return to after they forage out to private lands. Who would issue the special permit for lethal control? This also applies to bears and lions.*

Response 91: The refuge will work with the state and neighboring landowners to address any issues on a case by case basis.

Comment 92: *The plan does not specify a clear management scheme based on refuge history and focal species, including discussions of explicit management practices (step-down tasks for example), temporal aspects of the proposed practices, negative aspects on other focal species, and mitigation measures where necessary.*

Response 92: We feel this CCP provides broad but clear direction for future management. This document also proposes the completion of several step-down management plans, which can be revised every one to five years and will provide additional specifics. The public can review these plans.

Comment 93: *In apparent violation of CCP planning policy, which requires that “At a minimum, each refuge should develop goals for wildlife species or groups of species, habitat (including land protection needs), compatible wildlife-dependent recreation, other mandates (such as refuge-specific legislation, executive orders, special area designations, etc.), and fish, wildlife, and plant populations, as appropriate,” the draft CCP/EA contains no goals or objectives for wildlife species or groups of species.*

Response 93: We feel the draft CCP did meet the intent of the planning policy by explicitly discussing habitat needs of target species of wildlife and how those needs can be met through management actions. The final document was modified to add specific trumpeter swan population objectives from the “Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans.” Objectives were also added for moose and Arctic grayling.

GRAZING

Comment 94: *Why are grazing and fire proposed as management tools for arid uplands? Neither is appropriate for arid lands, especially with the loss of sagebrush habitats around the west.*

Response 94: ‘Arid uplands’ in cool regions are generally considered areas that receive less than 10 inches of precipitation annually. The average annual precipitation on the refuge exceeds 20 inches. Yet, due to the well-drained soils of the Centennial Sandhills, these habitats could be considered ‘arid’. This is also why fire and grazing are not commonly used as a tool in the sandhills. The remaining grassland habitats on the refuge did evolve with grazing and fire as a natural disturbance, and the refuge will continue to mimic these processes with management actions.

Comment 95: *Grazing on federal lands is an important issue to our members. There is no mention of how grazing will continue to be authorized and managed on the refuge.*

Response 95: The CCP states that the grazing program will continue. The Service will ensure that the program is prescriptive and supports and promotes the refuge’s habitat management objectives.

Comment 96: *We support the removal of interior fencing on the refuge to eliminate the potential for wildlife impacts, including altering wildlife movements. We ask the USFWS to fully analyze and develop an interior fence inventory on the refuge and analyze what fences need to be removed in the short-term and long-term and what fences can stay on the refuge without impacting wildlife habitat and wildlife movement.*

Response 96: A great number of fences have already been removed. The remaining fences are needed to properly manage the prescriptive grazing program. Most of the remaining fences are now wildlife-friendly; nevertheless, the refuge will continue to reevaluate the fencing program. The refuge is currently mapping all fences and noting their condition and design.

Comment 97: *All livestock grazing should be secondary to the native flora and fauna. The management focus should be on native habitats, not on the livestock aspect. Livestock fencing should accommodate the passage of wildlife.*

Response 97: The refuge has led the implementation of wildlife-friendly fences in the valley and continually utilizes wildlife-friendly designs.

Comment 98: *Simply to “direct” management of livestock grazing “towards” habitat and wildlife objectives is not sufficient to fulfill the Refuge System’s core mission to conserve wildlife first and foremost.*

Response 98: The strategy related to grazing has been modified to reflect this intent of only using prescriptive grazing to benefit wildlife habitat.

Comment 99: *Defenders has extensive experience helping ranchers manage livestock without harming wolves and other predators, and we would welcome the opportunity to help implement these practices on the refuge and/or adjacent lands.*

Response 99: Most of these successes have occurred on smaller landscapes. We have added language to consult with other partners who have successful methods for using nonlethal methods to control wolves preying on cattle.

Comment 100: *The CCP should take steps to increase resource resiliency by working to reduce non-climatic stressors on native wildlife and water resources, such as non-prescriptive livestock grazing.*

Response 100: The CCP does not propose any non-prescriptive grazing.

Comment 101: *Get rid of the cattle grazing on this land owned by national taxpayers, this grazing destroys the place. Let the ranchers rent the land they need from private landholders.*

Response 101: Prescriptive grazing by cattle is used as a habitat management tool to mimic natural disturbances and will not negatively impact habitats, including refuge waters.

Comment 102: *Prescribed fire should be stopped immediately. Fine particulate matter is released with this burning, as well as every chemical deposited on that land.*

Response 102: Prescribed burning is an important management tool that mimics a natural process. Properly used, it can help control invasive species and improve habitat for wildlife, including nesting migratory birds.

Comment 103: *That cattle grazing is allowed in the refuge is a travesty, polluting the streams and injuring ground nesting birds.*

Response 103: The refuge uses grazing as a tool to mimic the ecological services previously provided by bison. Several species of ground nesting birds prefer to nest in grazed areas, including long-billed curlews. Cattle are fenced from most riparian areas and are not typically allowed on the refuge until July 10th, minimizing disturbance to ground nesting birds.

BIODIVERSITY/INTEGRITY

Comment 104: *The CCP significantly redirects the purpose of the refuge, in part, to achieving a high degree of biodiversity; however, that ambiguous term is interpreted. The adoption of biodiversity as a comanagement objective not only dilutes the clear language embedded in the original purpose but tasks the manager with yet another mandatory consideration.*

Response 104: This CCP does not redirect the purposes of this refuge but it does comply with the Service's policy that requires managers to consider natural biodiversity when managing refuge lands. This does not impede the refuge from giving priority to migratory birds, the purpose for which it was established.

Comment 105: *Many of the management practices are conceptual, rather than precisely specified. For example, it states that the sagebrush/ Centennial sandhills habitat will 'be managed for biodiversity'. This type of statement is no guidance to future managers and is liable to 'seat of the pants' management rather than well thought best management practices.*

Response 105: This is a broad management plan, which will be followed by detailed step-down plans;

nevertheless, there is ample detail in this document to allow future managers and biologists to be consistent over the next 15 years. It does allow for creativity and innovation as new information and technologies become available.

Comment 106: *I could support additional monitoring if its purpose was to direct management practices but do not see a reason for the refuge system to conduct other types of research. There are plenty of institutions that can and will do that work.*

Response 106: This refuge provides a great outdoor classroom for researchers interested in developing a greater understanding of how this ecosystem functions and how best to protect and restore it. Permitted research is closely monitored and meets refuge objectives and needs.

Comment 107: *This draft CCP/EA inappropriately makes managing for biological integrity, diversity, and environmental health (BIDEH) the primary foundation of the document. The draft is pervaded by the unspoken and unproven philosophy that by managing for the vague concepts of biodiversity, integrity, and natural processes, somehow all wildlife management and conservation needs will be adequately addressed.*

Response 107: We don't disagree that BIDEH serves as one of the foundations of this plan. The U.S. Fish and Wildlife Service has a policy on BIDEH (Service Manual 601 FW 3) that directs refuges to consider the protection of a broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. When completing a CCP, we are to determine the appropriate management direction to maintain and, where appropriate, restore biological integrity, diversity, and environmental health, while achieving refuge purposes. We feel this plan has achieved that objective.

Comment 108: *Although biodiversity, integrity and natural processes are the foundation of the draft CCP/EA, the terms "integrity" and "natural processes" are never defined, even though the document includes a six page glossary.*

Response 108: These terms have been added to the glossary.

Comment 109: *The over-emphasis on BIDEH was carried to such an extreme that the Vision Statement includes no mention of managing, conserving, or restoring wildlife populations or of a desired future condition that includes healthy populations of all (or any) native wildlife species. Providing habitat of even the best possible quality is not an adequate future condition without focus on the wildlife.*

Response 109: Vision statements are very broad and typically do not identify population goals for specific wildlife species. These details are found in the goals,

objectives, strategies, and rationale in Chapter 4 of this document.

In addition, the Service has a biological integrity, diversity, and environmental health policy that requires the Service to consider the protection of a broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. It also requires that within the comprehensive conservation planning process, the Service should determine the appropriate management direction to maintain and, where appropriate, restore biological integrity, diversity, and environmental health, while achieving refuge purposes.

ROADS, TRAILS, AND FACILITIES

Comment 110: *We strongly opposed the closing of Idlewild Road and the associated boat launch. We enjoy driving this road and it doesn't get a lot of use. The Service should create an interpretive panel that relates the history of this area to the public including the waterfowl hunting history.*

Response 110: Idlewild Road will remain open with certain specifications:

Idlewild Road was built through a wetland site and therefore it will have to be continually maintained. As the road has deteriorated, vehicles have tended to drive off road causing damage to vegetation and compaction of the soil, thereby reducing the movement of water through this wetland site. The existing culvert will have to be replaced.

The refuge will post a sign recommending that only 4-wheel drive or high clearance vehicles utilize the road. The road may be closed at any time due to weather and road conditions.

Comment 111: *The final CCP should address where and how dirt bikes and other ATVs, including snowmobiles, use the refuge and how motorized use impacts wildlife, local landowners, and other refuge visitors.*

Response 111: As in the past, motorized vehicles, such as cars and licensed ATVs, will only be permitted on county roads and refuge roads currently open to vehicle use. This CCP does not expand refuge roads nor allow snowmachine use on refuge roads.

Comment 112: *The plan presents a "pro-development, one-size fits all refuges" concentration on constructing physical facilities and expanding public use, instead of recognizing the intrinsic values of this landscape. This approach is contrary to restoring and maintaining a wilderness character and preserving the powerful legacy this refuge represents.*

Response 112: Critically needed housing for added staff will be completed within the headquarters site on already disturbed ground.

The CCP proposes replacing two unsafe, condemned bridges along an existing road open to the public and an existing foot trail/service road.

Replacing the Red Rock Creek bridge will allow this section of the auto tour route to make a loop. Currently, visitors have to drive in and out the same way which doubles the disturbance to wildlife. This replacement will not impair current stream dynamics. The entire auto tour route will be interpreted with minimal signage and a brochure.

Replacing the failed bridge along the existing Sparrow Pond Trail will provide a safe passage for visitors to view wildlife and staff to access portions of the refuge for management and maintenance. This replacement will not impair current stream dynamics.

Comment 113: *We are concerned about the impacts that unrestrained research activities, as proposed in the proposed action, may have on the refuge's habitats and wildlife.*

Response 113: This document does not propose unrestrained research activities. Research will be permitted if it is found to be compatible and meets refuge data needs, goals, and objectives.

Comment 114: *Apart from its effects on habitat, the plan fails to disclose the costs of the projects it promotes.*

Response 114: It is difficult to predict the costs of all activities over 15 years as costs of materials and labor change over time. This document is used for planning purposes and to set priorities. It does not constitute a firm commitment to provide funding for all proposed actions.

Comment 115: *Plan appears inconsistent in that it promotes construction of bridges and roads that undermine habitat and wildlife use, while allowing existing structures, such as the dam on the Lower Lake that provides habitat management flexibility, to possibly fail from benign neglect.*

Response 115: The refuge roads and bridges already exist and are used by the public—there is no new road construction proposed in this document. Road maintenance is a standard activity on all public land. We will be maintaining the Lower Lake water control structure.

Comment 116: *The east side loop road should be reinstated with a new bridge across Red Rock River.*

Response 116: The east loop road will be repaired and the bridge will be replaced to be part of an interpreted auto tour route.

Comment 117: *While promoting stream function on one hand, on the other hand, the plan also promotes construction of two bridges that will impair stream*

dynamics on two major streams. The sole reason for constructing these bridges is to support new auto tour routes, a paradoxical approach to wildlife viewing especially on a refuge where wildlife can often be seen from existing roadways. However, in this case, by increasing disturbance in sanctuary areas, the auto tour routes themselves displace the very wildlife people come to see.

Response 117: The CCP proposes replacing two condemned bridges along an existing auto tour route and a hiking trail.

The auto tour route will be created along existing roadways currently open to the public, but will be interpreted with minimal signage and will require an existing bridge be replaced. This repair will not impair current stream dynamics.

The remaining bridge is an existing structure in need of replacement to allow Service staff to access portions of the refuge for management and maintenance. The public also uses this as a walking trail to view wildlife.

Comment 118: *Money will be saved in building costs by maintaining the current level of staff.*

Response 118: There has been no new refuge housing and limited staff additions for almost 50 years. Achieving the refuge vision and goals will take more than money, it will require added staff. A lack of housing in the remote valley has been a constant hindrance to expanding refuge programs and developing a greater understanding of how to best conserve, restore, and manage refuge resources.

Comment 119: *Two campgrounds are well maintained and consistently used by visitors to the area. Changes to the current refuge maintenance plan would be counter-productive.*

Response 119: The refuge campgrounds will continue to be minimally maintained, but routine maintenance is always needed to retain existing facilities, while some upgrades will be needed to provide access to physically challenged visitors.

Comment 120: *The area along Odell Creek between the county road and Sparrow Pond should be open to non-motorized access for hunting and fishing (in accordance with state regulations).*

Response 120: Odell Creek is already open for fishing. The described area has never allowed motorized vehicles. The area to the north of Odell Creek is proposed to be open to big game hunting. The area from the county road north to Odell Creek is closed to hunting to protect buildings, residents, and visitors in the Lakeview area. Please see the public use map (figure 14).

Comment 121: *The road which leads from the county road to the airstrip should be open for motorized*

access for hunting and wildlife viewing from July 1 to November or December, for people who exhibit a state-issued disability license.

Response 121: The proposed action did include making the Sparrow Pond Trail, pulloffs, signs, campsites, toilets, and kiosks accessible. The state makes provisions for disabled hunters to shoot from vehicles and the individual can work with the refuge to be accommodated.

Comment 122: *Needs more trails and access to view the birds (waterfowl and non) and critters (especially moose). Not everyone can hike over rough ground to reach the water's edge. Moreover viewing platforms would be very helpful.*

Response 122: There are three roads leading to the shore of Lower Red Rock Lake to view birds. Upper Lake has a boat launch leading to the edge of the lake. Viewing the refuge from county roads provides excellent opportunities to see waterfowl, moose, deer, sandhill cranes, coyotes, and sometimes a wolf. The CCP proposes to work with the county to provide accessible pulloffs so visitors can safely get out of the way of traffic. Public access trails exist to Sparrow Pond and Slough, and up Odell Creek. In keeping with wilderness designation, no new trails or structures are allowed to be built within the wilderness boundary. The eastern ponds are also open to the public for wildlife viewing with easy walking access to the water's edge in many places.

Comment 123: *I believe what access there is, should be closed (with the exception of Red Rock Road). All viewing of animals could be done by spotting scope from the main road, leaving the animals to roam free and wild without becoming habituated to human presence.*

Response 123: The majority of the refuge is road and trail free, particularly the wilderness area, which encompasses 66% of Red Rock Lakes Wilderness. The document does not propose any additional roads or trails.

Comment 124: *There was no mention to reopen the old loop road at the east side of the refuge by replacing the old bridge.*

Response 124: Creating an auto tour route along this loop road (and other roads) is included as a strategy in this final CCP. Red Rock Creek bridge will need to be replaced as part of this auto tour route.

Comment 125: *There is a proposal to close Lower Lake campground, an ill thought out plan in light of the road that has just been rehabbed.*

Response 125: This proposal was in alternative D, not the proposed action. Both campgrounds will remain open to the public.

Comment 126: *The proposal of keeping the refuge roads open all year will cost taxpayers a lot of money. It is also important to let the wildlife have a break from human contact.*

Response 126: The proposed action did not propose keeping the refuge roads open all winter. This is cost prohibitive and is probably impossible to achieve, given the amount of snowfall.

Comment 127: *Encourage the county to increase their maintenance of refuge roads.*

Response 127: The refuge has consistently worked with the county to maintain the county roads but we do recognize that this is a remote part of Montana, with a small population, and road maintenance dollars are limited.

Comment 128: *Those who enjoy the auto tour route early in the year are likely to end up stuck on either Elk Lake or North Centennial Road.*

Response 128: Any visitor to the Centennial Valley should take precautions and ensure they are aware of road conditions in this remote valley. These two roads are county roads and maintained by the county. The refuge will continue to encourage the county to adequately maintain these roads during high visitation periods but this depends on their available staff and resources.

Comment 129: *Do not allow over-snow vehicles on the auto tour route after December 2. This area will provide ideal cross-country skiing.*

Response 129: The entire refuge is closed to snowmobile use (except for the county roads) but open to cross country skiing.

Comment 130: *I did not find fencing directly addressed in any alternative. Much of the fencing is non-wildlife friendly and should be replaced.*

Response 130: Most of the refuge fencing is designed to be wildlife-friendly.

Comment 131: *Signage is important. It helps people better understand the assets available and the boundaries. Many tourists travel onto private land.*

Response 131: We agree and have proposed a balance between orienting visitors and maintaining the wilderness characteristics of the refuge through minimal signage.

Comment 132: *Given the massive economic problems and federal deficits, the projected staff and housing increases required for implementation of alternative B may have become unrealistic.*

Response 132: This CCP provides long-term guidance for management decisions. This document does state that these plans are often substantially above current

budget allocations, and are therefore primarily for Service strategic planning and program prioritization purposes. They do not constitute a commitment for additional funding. If funding does become available for the refuge system, this CCP will ensure these additional funds are spent responsibly and on the highest priorities.

VISITOR SERVICES PROGRAMS

Comment 133: *The plan appears too narrowly focused on expanding public use at the expense of habitat, wildlife and wilderness values.*

Response 133: The need for improving visitor service facilities are to better orient and welcome visitors. All of the projects will take place along existing trails and roads. These projects will not in and of themselves expand public use at the refuge, but will better educate the public about this unique and special refuge and its wildlife.

Comment 134: *The goal of providing environmental education to people in their car could be easily accomplished by a low power AM broadcast station similar to that used in numerous parks at a fraction of the cost and without adverse impacts to refuge wildlife.*

Response 134: Given the level of visitation, brochures and limited interpretive panels should be sufficient to provide adequate visitor information.

Comment 135: *Maintaining the aspen groves should be accomplished without harming wildlife. I've observed the drought as having the bigger impact. Expanding hunting is not acceptable.*

Response 135: Elk are a state managed species. The state has population and harvest objectives for southwestern Montana. The refuge is not an elk refuge and the concentration of elk in closed areas during hunting season is not only harming refuge habitats, but prevents the state from achieving its population and habitat goals.

Comment 136: *The plan indicates that opening of the interior of the refuge to hunting will minimize "damage" done by concentrations of big game. Relying on willow browsing alone does not consider the fact that consumption by ungulates is a primary use for willow. Where elk are concerned, it is difficult to see what damage they are causing considering the refuge hosts a livestock grazing program and that the interior of the refuge, an area to be opened to hunting, has ample grass.*

Response 136: Our concern related to elk populations is primarily related to aspen regeneration. Aspen stands in the Centennial Mountains, including the refuge, are predominantly comprised of older age-class trees, suggesting that recruitment of young aspen has not occurred for several decades. Recent

landscape-scale disturbances (wildfire) have resulted in considerable suckering of aspen in the Centennial Mountains. However, data suggest that most of these suckers do not get above browse height due to overbrowsing by elk. This impacts a host of other species, including nesting songbirds. Lastly, the major riparian areas on the refuge are fenced to exclude cattle, so measured impacts of browse in these areas is due to native browsers.

Comment 137: *The plan does not state how much area will be opened to hunting. The plan needs to assess the adverse impacts caused to winter survival of big game such as moose, caused by these animals being chased back and forth across the refuge.*

Response 137: Over 60% of the refuge will be open to some form of hunting, including the area open only for moose hunting. Most of the hunting areas are roadless. Over 35% of the refuge is closed to all hunting, but is available for other public uses such as wildlife viewing and photography. The hunting areas are also open to these non-hunting uses.

Moose hunting is only allowed in the southeast corner of the refuge. We do not foresee any impacts to moose from opening areas to other hunting. Other willow habitat closed to hunting offers excellent opportunities for the public to view moose year-round.

Wintering moose populations have increased at an annual average rate of 2.4% (SE = 0.06) for the past 40 years. This growth occurred concurrent with regulated harvest. We work closely with the State of Montana to monitor the population and habitat conditions.

Comment 138: *Animals that once were viewable to the public will be displaced by hunting and hunting will go from a quality experience to a killing field where big game is encircled by vehicles and shot as they congregate.*

Response 138: Hunting only occurs during a portion of the year allowing for ample viewing opportunities for the majority of visitors.

Due to the lack of roads within Red Rock Lakes Wilderness, elk can not be surrounded as they move into the timber and more secure hiding cover. We will closely monitor hunters for any illegal activities during hunting season.

Comment 139: *Refuge legislation weighs priority public uses equally, thus Service personnel have an ethical responsibility to set aside their biases, be objective, and consider non-hunting uses on the same par as they might hunting.*

Response 139: Waterfowl hunting is limited to approximately 1 month each year on a limited area (approximately 8% of huntable habitat) of the refuge. Additionally, portions of the refuge were acquired

with monies obtained through the purchase of federal migratory bird hunting stamps by waterfowlers. Use of these monies to purchase lands mandates that waterfowl hunting be allowed on no more than 40% of the area.

Big game hunting is a tool to manage ungulate populations. Numbers of elk within the hunt area are much higher than state population objectives. The elk herd in southwestern Montana has doubled in the last 2 decades. Habitats throughout the area are also being impacted. The expanded area that is being opened to hunting is where elk are congregating in large numbers.

The refuge provides the same access to non-hunting individuals within hunt areas. The refuge also provides approximately 17,826 acres where hunting is not allowed.

Comment 140: *Does the refuge respond to inquiries from the hundreds of school children and classrooms that write asking about swans? Has it incorporated overall environmental education into the existing popularity of trumpeter swans?*

Response 140: The refuge responds to school children irrespective of the content of their inquiries. Additionally, the refuge's environmental education program will incorporate information on swans and other migratory birds and resident wildlife that utilize the refuge through the development of a swan poster and website.

Comment 141: *Why are only areas east of Upper Lake open to moose hunting given concern over woody browse utilization. Open more of the refuge (possibly westward of Odell Creek)? If the permit numbers remain the same, it would better disperse hunters.*

Response 141: The current moose hunting area encompasses the majority of riparian habitat utilized by wintering moose on the refuge.

Concentrating moose hunters in an exclusive, designated area allows for a quality hunting experience (no competition with other hunters) and assists in law enforcement efforts.

Comment 142: *Expansion of big-game hunting should not be permitted in areas that have been set aside as fall waterfowl feeding sanctuaries. The location of fall sanctuary feeding areas for swans and other waterfowl should be clearly portrayed on refuge use maps.*

Response 142: We have not proposed opening any refuge waters that have traditionally been set aside as waterfowl sanctuaries. The final maps do depict most of the lakes on the refuge as closed to hunting. This is specifically to provide this sanctuary for trumpeter swans and other waterfowl.

Comment 143: *Fishing throughout the refuge should be limited to single-hook lures. There are some monster grayling in Red Rock Creek which are vulnerable to treble-hook lures. Red Rock Creek, along with the Culver, Widgeon and McDonald Ponds, should be considered for catch-and-release regulations.*

If Yellowstone National Park permits catch and release, single barb-less hooks, artificial flies only, why can't the RRLNWR?

Response 143: We are continually looking for ways to reduce impacts to Arctic grayling but don't believe that instituting this restriction would be worth the added complexity to the refuge's fishing program. One tool to reduce impacts to grayling populations is for anglers to keep the nonnative fish that are caught in accordance to state regulations.

Comment 144: *Last year we submitted a request to increase fishing access in the refuge and that is not in the CCP. The three creeks and three ponds in which fishing is currently permitted do not hold many fish, making them unattractive for fishermen. The larger lakes, Upper and Lower Red Rock Lakes, for example, are the ones that are of most interest and there is no provision in the plan for opening them to fishing.*

I would have liked to have seen a short period of time in the season allocated to fly-fishing in the lakes.

Response 144: Red Rock Lakes NWR was established to protect primarily migratory birds. Upper and Lower Red Rock Lakes are extremely important to waterbirds during breeding and migration. The refuge hosts tens of thousands of migrating waterfowl before freeze-up each fall. Allowing fishing was not considered because the refuge believes that the increased use of the lakes from anglers would have a detrimental impact to resting and feeding migratory birds, including the thousands of swans (trumpeter and tundra) that refuel here. Some additional streams will be opened to fishing access (see figure 14).

Comment 145: *The lakes don't need motorized craft (electric motors should not be permitted) but kayaks, canoes, float tubes, pontoon boats should all be permitted.*

Response 145: Non-motorized boats such as canoes and kayaks are already permitted on Upper and Lower Red Rock lakes, River Marsh, and Red Rock Creek. Motorized craft have not been permitted on the lakes for years, with the exception of the area below the WCS on Lower Red Rock Lake.

There is no boating or floating allowed on the eastern ponds.

Comment 146: *I am disappointed, but not surprised to see the complete absence of environmental*

education from the proposed action. That seems like a shame.

Response 146: Objectives and strategies have been added to the document to accommodate limited environmental education programs.

Comment 147: *There is a notable absence of discussion on accessible trails until the facilities section. This should be a bit more specific.*

Response 147: Language describing accessible trails has been added to the final document.

Comment 148: *In the previous draft there is much more specific language about what will be provided in terms of accessible facilities. Why was this removed? Most could be added without detracting from the wilderness aspect of the refuge.*

Response 148: We have added back the language that describes proposed accessible facilities.

Comment 149: *Wouldn't there be conflicts between anglers and hunters? Would you allow fishing in hunting areas during hunting season?*

Response 149: Yes, there could be conflicts but fishing during hunting season is minimal so there should be few conflicts.

Comment 150: *In alternate C, Tom Creek and MacDonald ponds would be opened to fishing on June 15 in an area that isn't open until July 15. Please clarify.*

Response 150: The proposed action, alternative B, lists these areas as open according to state seasons.

Comment 151: *All of the waters discussed should be shown on the public use map.*

Response 151: We try to keep the maps uncluttered, but we agree with this comment and have identified waters discussed on the maps in the final CCP (see figure 14).

Comment 152: *Offer upland game and webless migratory bird game hunting opportunities under state regulations on lands open to big game hunting.*

Response 152: There were no requests during public scoping to open upland game bird hunting on the refuge. Nevertheless, this would be a new hunting opportunity for a new species of wildlife and according to Service policy would require full public participation and the preparation of a separate hunt plan. The Service may pursue this opportunity in the future and will be involving the state and the public in the evaluation.

Comment 153: *Reinstate walk-in waterfowl hunting opportunities along Odell Creek and Sparrow Slough and Pond.*

Response 153: The refuge already provides considerable opportunities for waterfowl hunting. This final document also proposes keeping Idlewild Road open rather than closing it, a part of the original proposed action in the draft CCP. This road will continue to facilitate waterfowl hunting on the west end of the refuge, including opportunities to walk in.

Comment 154: *It would be easier to follow if all references to trails were under one section.*

Response 154: The more specific trail projects are within respective strategies and are more generally mentioned within the facilities objective.

Comment 155: *All discussion on accessible trails and blinds have been removed. Why? The Service must provide the same opportunities for all visitors. There are opportunities for creating accessible trails in areas not designated as wilderness.*

Response 155: We added language to the strategies identifying a blind below Lower Lake water control structure, an accessible trail at Sparrow Pond, and vehicle pulloffs along county roads.

Comment 156: *Expanding big game hunting is not compatible with the purposes for which the refuge was established. Verified data are lacking on the biological impacts of this expansion.*

Response 156: Hunting is a legitimate and compatible use of this refuge. This refuge was not established as an elk preserve, where hunting is prohibited. The Service feels the analysis of expanding the existing hunting program was sufficient, which found the expanded big game hunting compatible with refuge purposes.

Comment 157: *The Service must ensure that sufficient funds are available before it approves a plan to expand hunting, considering the economic impacts to the refuge and surrounding businesses as a result of decreases in use by non-consumptive users during hunting season.*

Response 157: As outlined in the compatibility determination, the Service will ensure that the necessary resources, which should be minimal, are available prior to opening this expanded hunting area. This refuge is located in one of the most remote valleys in Montana. Most of the refuge is surrounded by open ranch land and very few businesses exist. Of the nearby businesses, many are dependent upon hunters' dollars to sustain profitability. Therefore, expanded hunting would most likely positively benefit local businesses. Moreover, most non-consumptive users frequent the refuge and surrounding area during the summer, when hunting seasons are not open.

Comment 158: *We propose that expanding hunting [at] Red Rock Lakes is a significant action and*

requires the preparation of an EIS—citing public safety, unique characteristics of the area, endangered and threatened species, or involving highly uncertain or unique or unknown risks.

Response 158: The preferred alternative, including the proposal to expand the current hunting program, is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)C of the National Environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement is not warranted. Hunting has occurred on this refuge for decades and has been found to be compatible. This expansion will assist the refuge in achieving its management objective of reducing browsing pressure on aspen habitats. These habitats are important to various migratory birds that use the refuge, the purpose for which this refuge was established. The state has determined that the elk population in this valley exceeds established goals. Harboring of elk on the refuge may exacerbate this issue, thereby contributing to habitat damage not only to the refuge, but to the surrounding valley habitats.

There are no known threatened or endangered species that inhabit the refuge.

Comment 159: *The impacts of expanded hunting on the experience and potential socioeconomic contribution of these non-consumptive users must be properly taken into account—including being injured or killed by a bullet or having one's dog or horse killed, or seeing a wounded animal.*

Response 159: This is a very remote refuge and non-hunting visitors are very seasonal (mostly summer only, when the roads are most passable), which rarely overlaps with the hunting seasons. Visitors are allowed to travel all public use areas during the hunting season, but a vast area on the east end of the refuge, which includes an auto tour route for viewing wildlife, is closed to all hunting activities year-round providing an exclusive use area for these visitors.

Comment 160: *The interpretation proposal is bold. We support the proposed action outlined in the CCP, but caution the refuge staff about doing too much with interpretation. Additional signage and kiosks at Lower Lake Road, Red Rock Creek and at the northwest corner entrance might take away from the rustic nature of the refuge. Providing information at the headquarters in one central location might lessen the impacts on a visitor's wilderness experience.*

Response 160: Interpretation programs allow for visitors to orient themselves while creating a greater understanding of the refuge and its resources. To reduce impacts to the wilderness setting, the existing deteriorating kiosks and panels will be replaced at their respective locations. One new one will be built at the entrance of Lower Lake Road. Interpreting

habitat and wildlife along the auto-route may be a combination of low-mounted signs and a brochure. Not all people will use a brochure or have access to one but will readily stop at interpretive panels.

Comment 161: *None of your proposals take into consideration the purpose and nature of our new environmental center. It is extremely important that any future planning must take into careful consideration the educational activities and public programs that we are now planning and which will incorporate much of the refuge.*

Response 161: At the time of preparing this document, there were no proposals or information provided to the refuge on the plans for these structures in Lakeview being used as an environmental education center; nevertheless this document does support environmental education and interpretation activities that will meet Service objectives. Environmental education partnership opportunities that support the refuge's environmental education objectives outlined in this CCP and the future Visitor Services Plan will be embraced with available, but limited refuge resources, as appropriate.

Comment 162: *Many of your proposals are inappropriate and inconsistent with the official objectives and purposes for which the refuge was established. None of the proposals appear to put wildlife first—including opening the entire refuge to hunting. This decries the entire purpose for which the refuge was established.*

Response 162: The Service does not permit any activity to occur on a refuge that is not compatible with the purposes for which it was established. This refuge was not established to prevent hunting of wildlife. Hunting is a legitimate and traditional public use that has been found compatible on this and most wildlife refuges in the nation. The 1997 National Wildlife Refuge System Improvement Act lists hunting as one of the six priority public uses that we are to consider allowing on refuges. Hunting is not open on the entire refuge.

Comment 163: *There are few schools in this remote area—offering expanded environmental education kits and web site availability to teachers seems unnecessary.*

Response 163: We agree that environmental education, particularly at the surrounding schools, should be minimal. The refuge does host over 12,000 visitors annually, most in the summer months when school is out. Some of these visitors are children and the refuge has missed opportunities to educate these future refuge users on why the refuge is there and why it is important to ensure it remains through their lifetime and for use by their own children. Tools such as interactive websites allow schools across the nation to learn about this refuge and the National Wildlife Refuge System.

Comment 164: Expanding hunting areas will only allow unethical hunting, meaning flock shooting at long range. I am not opposed to hunting.

Response 164: The refuge is also concerned about the impacts of hunting in open areas throughout the refuge, and will work with the state to determine what the best methods for promoting an ethical, quality hunt. The refuge may set limitations on this expanded big game hunting area including initially limiting the number of hunters that can hunt this area at one time. After coordinating with the state and refuge law enforcement, this and other restrictions may be placed on hunting to ensure it is conducted safely and ethically.

The refuge will continue to work to provide law enforcement presence during the hunting seasons.

Comment 165: *Allowing Montana Fish, Wildlife and Parks to set the season and quota for moose hunting is a mistake.*

Response 165: Moose are a state-managed species. The refuge has a long partnership with the state in monitoring the population on the refuge and in the valley. According to survey data and browse studies, moose populations are healthy and can sustain this annual limited harvest, such as the current eleven permits issued for this hunting unit. To provide viewing opportunities, the length of the moose hunting season on the refuge will remain shorter than the state season for HD334. This may change in the future to meet management and harvesting objectives.

Comment 166: *Opening upland game bird hunting would not be appropriate. Visitors get a lot of pleasure out of seeing a 'few chickens'. All of the surrounding public lands are open to grouse hunting. Now that a few sage grouse are appearing, why risk their safety?*

Response 166: This final CCP does not propose opening upland game bird hunting.

Comment 167: *Sometimes families who camp at the Upper Lake ride bike and hike on the roads in this part of the refuge. Opening this area to fishing and other access (but not waterfowl hunting) from July 1 until December 1 would provide opportunities for people with disabilities to fish and view wildlife.*

Response 167: Wildlife viewing is allowed year-round on the refuge. The campgrounds are open year-round but are only maintained until the roads close due to winter weather. Fishing on Upper Lake and Lower Lake is not compatible due to disturbances to swans and other waterfowl.

Comment 168: *I would recommend a five-year trial period to allow fishing in the Upper and Lower Lakes.*

Response 168: Fishing on Upper Lake and Lower Lake is not compatible due to disturbances to swans and other waterfowl.

Comment 169: *The moose season should be closed to maintain ponds and “birding” road access. A wildlife refuge should be a refuge, not for semi-private hunting clubs.*

Response 169: Moose hunting is limited to a small portion of the refuge and is a limited (approximately eleven permits) state-managed hunt. The majority of the refuge is open to wildlife photography and observation, particularly in the summer, when most refuge visitors come to the valley. In addition, this final CCP proposes upgrading a current public road on the east end of the refuge providing interpretation of the various refuge habitats. This would be located in a large area closed to all hunting.

Comment 170: *One very important thing missing from “Appendix A—Key Legislation and Policies” is the 2007 Executive Order: Facilitation of Hunting Heritage and Wildlife Conservation. President Bush recognized the importance of our hunting heritage and he signed this executive order to make sure that hunting opportunities were expanded and enhanced on public lands (including Red Rock Lakes National Wildlife Refuge).*

Response 170: This was added to the final document.

Comment 171: *I understand the issue of ungulates retreating to refugia and increasing their impact there, but think extending the season to match state regulations, plus opening up the whole refuge will unduly increase impacts to the moose population. There is some question regarding the migratory ecology of the moose herd that winters in the refuge, and I would propose more monitoring and research to determine where the moose go for summer range, and whether there is a non-migratory local population mixed with a migratory population.*

Response 171: The refuge works closely with Montana Fish, Wildlife and Parks on moose management on, and surrounding, the refuge. Surveys have shown a steady increase in the moose population on the refuge, indicating that current harvest levels are sustainable.

Comment 172: *Everyone wanted to reduce big game hunting. This is obscene and flies in the face of what the refuge system was set up for.*

Response 172: There was support for not only maintaining, but expanding big game hunting on the refuge. The refuge system, including Red Rock Lakes National Wildlife Refuge, was not established to prevent all hunting. The laws governing the refuge system state that hunting has been identified as one of the six priority public uses for the national wildlife refuge system. Hunting is a traditional use on the refuge and has been found compatible with the purposes for which it was established.

GENERAL COMMENTS

Comment 173: *I believe it was a mistake not to include area landowners in the planning process.*

Response 173: The public, including landowners, was invited to all public meetings and asked to provide written comments. Three public meetings were held at the start of this planning process, and two when the draft plan was released. The public was also given an additional 30 days to review this plan, for a total of 60 days. All comments, including those on the draft CCP and EA, were considered throughout the planning process and resulted in numerous modifications to this final CCP.

Comment 174: *We do not agree with the concept of our property being taken from us by a government entity in the draft CCP.*

Response 174: In no way does this plan propose taking any land from any private landowner.

Appendix B

Key Legislation and Policies

This appendix briefly describes the guidance for the National Wildlife Refuge System and other policies and key legislation that guide the management of Red Rock Lakes National Wildlife Refuge.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. (National Wildlife Refuge System Improvement Act of 1997)

GOALS

- To fulfill our statutory duty to achieve refuge purpose(s) and further the Refuge System mission.
- Conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- Perpetuate migratory bird, inter-jurisdictional fish, and marine mammal populations.
- Conserve a diversity of fish, wildlife, and plants.
- Conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- To foster understanding and instill appreciation of fish, wildlife, and plants and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

GUIDING PRINCIPLES

There are four guiding principles for management and general public use of the Refuge System established by Executive Order 12996 (1996):

- **Public Use**—The Refuge System provides important opportunities for compatible wildlife-dependent recreational activities involving

hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

- **Habitat**—Fish and wildlife will not prosper without high-quality habitat and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges.
- **Partnerships**—America’s sportsmen and women were the first partners who insisted on protecting valuable wildlife habitat within wildlife refuges. Conservation partnerships with other federal agencies, state agencies, tribes, organizations, industry, and the general public can make significant contributions to the growth and management of the Refuge System.
- **Public Involvement**—The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of our national wildlife refuges.

LEGAL AND POLICY GUIDANCE

Management actions on national wildlife refuges are circumscribed by many mandates including laws and executive orders. Regulations that affect refuge management the most are listed below.

American Indian Religious Freedom Act

(1978)—Directs agencies to consult with native traditional religious leaders to determine appropriate policy changes necessary to protect and preserve Native American religious cultural rights and practices.

Americans with Disabilities Act (1992)—Prohibits discrimination in public accommodations and services.

Antiquities Act (1906)—Authorizes the scientific investigation of antiquities on federal land and provides penalties for unauthorized removal of objects taken or collected without a permit.

Archaeological and Historic Preservation Act

(1974)—Directs the preservation of historic and archaeological data in federal construction projects.

Archaeological Resources Protection Act (1979), as amended—Protects materials of archaeological

interest from unauthorized removal or destruction and requires federal managers to develop plans and schedules to locate archaeological resources.

Architectural Barriers Act (1968)—Requires federally owned, leased, or funded buildings and facilities to be accessible to persons with disabilities.

Clean Water Act (1977)—Requires consultation with the U.S. Army Corps of Engineers (404 permits) for major wetland modifications.

Dingell-Johnson Act (1950)—Authorizes the Secretary of the Interior to provide financial assistance for state fish restoration and management plans and projects. It is financed by excise taxes paid by manufacturers of rods, reels, and other fishing tackle. It is also known as the Federal Aid in Sport Fish Restoration Act.

Emergency Wetlands Resources Act (1986)—Promotes wetland conservation for the public benefit to help fulfill international obligations in various migratory bird treaties and conventions. The act authorizes the purchase of wetlands from Land and Water Conservation Fund monies.

Endangered Species Act (1973)—Requires all federal agencies to carry out programs for the conservation of endangered and threatened species.

Executive Order No. 7023 (1935)—Establishes Red Rock Lakes National Wildlife Refuge “as a refuge and breeding ground for birds.”

Executive Order 11988 (1977)—Requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, and preserve the natural and beneficial values served by the floodplains.

Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System (1996)—Defines the mission, purpose, and priority public uses of the National Wildlife Refuge System. It also presents four principles to guide management of the Refuge System.

Executive Order 13007, Indian Sacred Sites (1996)—Directs federal land management agencies to accommodate access to and ceremonial uses of Indian sacred sites by Indian religious practitioners, avoid adversely affecting the physical integrity of such sacred sites, and where appropriate, maintain the confidentiality of sacred sites.

Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation (2007)—Directs federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, including the Department of the Interior and the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

Federal Noxious Weed Act (1990)—Requires the use of integrated management systems to control or contain undesirable plant species and an interdisciplinary approach with the cooperation of other federal and state agencies.

Federal Records Act (1950)—Requires the preservation of evidence of the government’s organization, functions, policies, decisions, operations, and activities, as well as basic historical and other information.

Federal Reserved Water Right (1999)—This compact, entered into by the state of Montana and the U.S. Fish and Wildlife Service, settles the reserved water rights for Red Rock Lakes National Wildlife Refuge. The settlement has been ratified by the Montana legislature and approved by appropriate federal agencies and the Montana Water Court.

Fish and Wildlife Act (1956)—Directs the Secretary of the Interior to develop the policies and procedures necessary for carrying out fish and wildlife laws and to research and report on fish and wildlife matters. The act establishes the U.S. Fish and Wildlife Service within the Department of the Interior, as well as the positions of Assistant Secretary for Fish and Wildlife and Director of the Service.

Fish and Wildlife Coordination Act (1958)—Allows the U.S. Fish and Wildlife Service to enter into agreements with private landowners for wildlife management purposes.

Migratory Bird Conservation Act (1929)—Establishes procedures for acquisition by purchase, rental, or gifts of areas approved by the Migratory Bird Conservation Commission.

Migratory Bird Hunting and Conservation Stamp Act (1934)—Authorizes the opening of part of a refuge to waterfowl hunting.

Migratory Bird Treaty Act (1918)—Designates the protection of migratory birds as a federal responsibility; and enables the setting of seasons and other regulations, including the closing of areas, federal or nonfederal, to the hunting of migratory birds.

National Environmental Policy Act (1969)—Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and use public participation in the planning and implementation of all actions. Federal agencies must integrate this act with other planning requirements, and prepare appropriate documents to facilitate better environmental decision making. (From the Code of Federal Regulations (CFR), 40 CFR 1500)

National Historic Preservation Act (1966), as amended—Establishes as policy that the federal government is to provide leadership in the preservation of the nation’s prehistoric and historical resources.

National Wildlife Refuge System Administration Act (1966)—Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of a refuge, provided such use is compatible with the major purposes for which the refuge was established.

National Wildlife Refuge System Improvement Act of 1997—Sets the mission and administrative policy for all refuges in the National Wildlife Refuge System; mandates comprehensive conservation planning for all units of the Refuge System.

Native American Graves Protection and Repatriation Act (1990)—Requires federal agencies and museums to inventory, determine ownership of, and repatriate cultural items under their control or possession.

Pittman-Robertson Act (1937)—Taxes the purchase of ammunition and firearms and earmarks the proceeds to be distributed to the states for wildlife restoration. It is also called the Federal Aid in Wildlife Restoration Act or P-R Act.

Refuge Recreation Act (1962)—Allows the use of refuges for recreation when such uses are compatible with the refuge’s primary purposes and when sufficient funds are available to manage the uses.

Rehabilitation Act (1973)—Requires programmatic accessibility in addition to physical accessibility for all facilities and programs funded by the federal government to ensure that any person can participate in any program.

Volunteer and Community Partnership Enhancement Act (1998)—Encourages the use of volunteers to help in the management of refuges within the Refuge System; facilitates partnerships between the Refuge System and nonfederal entities to promote public awareness of the resources of the Refuge System and public participation in the conservation of the resources; and encourages donations and other contributions.

Wilderness Act (1964)—The Wilderness Act of 1964 (Public Law 88-577 (16 U.S.C. 1131-1136)) established the National Wilderness Preservation System and a process for federal and land management agencies, including the Service, to recommend wilderness areas to Congress. The Act defines wilderness as “A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.” An area of wilderness is further defined to mean in this act an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Appendix C

Section 7 Biological Evaluation

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

For

Development and Implementation of the Comprehensive Conservation Plan for the
U. S. Fish and Wildlife Service
Red Rock Lakes National Wildlife Refuge

Originating Person: Bill West, Jeff Warren, and Laura King
Telephone Number: 406/276/3536
Date: May 7, 2009

- I. Region: 6
- II. Service Activity (Program): Red Rock Lakes National Wildlife Refuge—
Comprehensive Conservation Plan
- III. Pertinent Species and Habitat:
 - A. Listed species and/or their critical habitat within the action area:
Gray wolf, experimental population, non-essential
 - B. Proposed species and/or proposed critical habitat within the action area:
None
 - C. Candidate species within the action area: None
- IV. Geographic area or station name and action:
Station: Red Rock Lakes National Wildlife Refuge
Action: Development and implementation of Comprehensive Conservation Plan
- V. Location: map attached (Figure 1 of the accompanying CCP)
 - A. Ecoregion Number and Name:
Red Rock Lakes is located in Region 6, Mountain-Prairie Region, within the
Upper Missouri, Yellowstone, and Upper Columbia Rivers Ecosystem in southwestern
Montana.
 - B. County and State: Beaverhead County, Montana
 - C. Distance (miles) and direction to nearest town: Red Rock Lakes National Wildlife
Refuge is located 47 miles west of West Yellowstone and 38 miles east of the town
of Lima, Montana
 - D. Species/habitat occurrence:

Gray Wolf: There are no established packs on the refuge but wolves have recently
begun utilizing the refuge and the surrounding Centennial Valley.

VI. Description of proposed action:

This proposed action will implement the goals, objectives, and strategies of Red Rock Lakes National Wildlife Refuge comprehensive conservation plan for the next 15 years, in addition to fulfilling the goals of the National Wildlife Refuge System.

There will be improved management of wetland habitats for trumpeter swans and other waterfowl. Management will focus on maintaining high wetland productivity through infrequent drawdowns of modified and created wetlands to benefit breeding and migrating waterfowl. The management of riparian areas will be designed to benefit migratory bird species and adfluvial Arctic grayling. Some modified wetlands will be restored back to free-flowing streams and associated riparian corridors. Management actions (such as prescriptive cattle grazing and prescribed fire) will be directed toward specific habitat and wildlife objectives, with increased and improved oversight, monitoring, and research (when appropriate) conducted to assess if management objectives are being met. If bison become designated as free-ranging wildlife in Montana, the refuge will study the impact of participating in state-wide reintroduction initiatives.

Although there are no known established wolf packs on the refuge or in the surrounding Centennial Valley, wolves have recently been utilizing the refuge. During public scoping there were concerns raised by the public, in particular cattle grazers on and off the refuge, regarding potential future wolf predation on cattle. The Service added the following strategy to the CCP to address impacts from wolves should this occur:

Do not permit lethal control of carnivores (such as wolf, grizzly bear, and mountain lion) on the refuge to protect cattle used in the prescribed grazing program without permission from the refuge manager, a special use permit, and consultation with other partners who have successfully used nonlethal methods for controlling wolves preying on cattle.

Visitor Services

Management will emphasize improving and maintaining high-quality public opportunities for wildlife-dependent recreation for visitors of all abilities. Visitors will be better oriented to the refuge through accurate brochures and limited signage. Some of the criteria for all public use programs is to (1) ensure all proposed uses are compatible, (2) visitors know that they are visiting a national wildlife refuge, (3) visitors understand the specific regulations in place to provide for their safety and protection of the refuge resources and wildlife, and (4) any additional visitor facilities and signage complement the refuge's wilderness setting. In this plan, additional environmental education and interpretation opportunities will be provided in order to better orient the public while fostering support for refuge programs through a better understanding and awareness of the values of the refuge and Centennial Valley.

Hunting programs will continue to be modified or expanded to provide quality hunting experiences while ensuring that trumpeter swans and other priority migratory birds are provided protected resting areas. An auto tour route along roads open to the public will be developed and interpreted through a brochure and minimal signage. An accessible hunting/photo blind will be provided for photographers and hunters with disabilities.

Facilities and Staff

Refuge and visitor services facilities will continue to be maintained, including historical structures that are being used. The staff numbers and refuge housing has remained fairly stagnant since the 1950s. The refuge currently has five full-time staff members, including one biologist. In order to implement this plan, additional staff will be required. Up to four residences will be needed to accommodate additional staff. These residences will complement the other refuge buildings and be constructed within the same general area as the current refuge houses and headquarters.

VII. Description of the proposed action:

A. Explanation of the effects of the action on species and critical habitats in items III. A, B, and C:

Gray Wolf: Implementing the CCP will not have detrimental effects on gray wolves. The actions proposed in the CCP will conserve or enhance the habitat and prey that wolves utilize. It is difficult to predict if a wolf pack will become established in the valley and if any issues will arise regarding cattle grazers. The CCP does briefly address this in a strategy. The CCP does not completely discount lethal methods to address future issues. Nevertheless, this would be the last resort, requiring management approval and a special use permit.

B. Explanation of actions to be implemented to reduce adverse effects:

The refuge is surrounded by cattle ranches and also utilizes prescriptive cattle grazing as a habitat management tool. Cattle grazing on the refuge is limited to late season (i.e., after July 10) and most cattle are off the refuge by mid-September. This (1) limits the time that wolf depredation on cattle can occur, (2) ensures that abundant native prey are available for wolves, and (3) provides for larger calves when permittees put cattle on the refuge. These factors have been successful to date in preventing wolf depredation on cattle used for habitat management. There are still concerns, expressed by the public, that wolves have the potential to depredate cattle on the refuge. In anticipation of this occurring, a strategy was added to the final CCP that will allow lethal control of wolves with refuge manager approval and a special use permit. Before this will be permitted, the Service will work with other partners, including the state and livestock owners, to exhaust all nonlethal methods.

VIII. Effect determination and response requested: (*=optional)

A. Listed species/designated critical habitat:

<u>Determination</u>	<u>Response requested</u>
no effect to species/critical habitat (species/unit: _____)	<u> X </u> *Concurrence
may affect, but is not likely to adversely affect species/critical habitat (species/unit: <u>gray wolf</u>)	<u> X </u> Concurrence
no effect to species/critical habitat (species/unit: _____)	_____ Formal Consultation

Bill West

6/5/09

Bill West
Project Leader
Red Rock Lakes National Wildlife Refuge
Lima, MT

Date

IX. Reviewing ESO Evaluation:

- A. Concurrence _____ Noncurrence _____
- B. Formal consultation required _____
- C. Conference required _____
- D. Informal conference required _____

R. Mark Wilson

6-8-09

R. Mark Wilson, Ecological Services
Supervisor, Ecological Services
Helena, MT

Date

Appendix D

Preparers

This document is the result of the extensive, collaborative, and enthusiastic efforts by members of the planning team shown below.

<i>Team Member</i>	<i>Position</i>	<i>Work Unit</i>
Suzanne Beauchaine	Wildlife refuge specialist (assistant manager)	Red Rock Lakes National Wildlife Refuge, Lima, MT
Laurel Bowen	Editor	TBC Solutions, Clinton, TN
Bob Brannon	Area biologist	Montana Fish, Wildlife, and Parks; region 3; Sheridan, Montana
Mark Ely	Geographic information system (GIS) specialist	Division of Planning, region 6, Lakewood, CO
Laura King	Planning team leader	Division of Planning, region 6, Cayuga, ND
Karen Newlon	<i>Former</i> biological science technician (wildlife)	Red Rock Lakes National Wildlife Refuge, Lima, MT
Mike Parker	<i>Former</i> Refuge manager, through 8/08	Red Rock Lakes National Wildlife Refuge, Lima, MT
Jeff Warren	Wildlife biologist	Red Rock Lakes National Wildlife Refuge, Lima, MT
Bill West	Refuge manager	Red Rock Lakes National Wildlife Refuge, Lima, MT

Many organizations, agencies, and individuals provided invaluable assistance with the preparation of this CCP. The Service acknowledges the efforts of the following individuals and groups towards the completion of this plan. The diversity, talent, and knowledge contributed dramatically improved the vision and completeness of this document.

<i>Contributor</i>	<i>Title</i>	<i>Agency</i>
Steve Berenzen	<i>Former</i> refuge supervisor	USFWS
Glenn Boltz	Fisheries biologist	USFWS
Rick Coleman	Assistant regional director, Refuge System	USFWS
Tim Covino	Graduate student, hydrology	Montana State University
Steve Custer	Professor, earth sciences	Montana State University
John Esperance	Chief, Comprehensive and Land Protection Planning	USFWS
Sheri Fetherman	Chief, Division of Education and Visitor Services	USFWS
Sean Fields	Wildlife biologist/GIS	USFWS

<i>Contributor</i>	<i>Title</i>	<i>Agency</i>
Brian Hackett	Range specialist	BLM
Dave Hamilton	Ecologist	USGS
Shannon Heath	Outdoor recreation planner	USFWS
Lynn Kaeding	Fisheries biologist	USFWS
Richard Keigley	Research ecologist	USGS
Wayne King	Wildlife biologist	USFWS
Nathan Korb	<i>Former</i> Master's candidate	Colorado State University
Murray Laubhan	<i>Former</i> research ecologist	USGS
Rachel Laubhan	Wildlife biologist	USFWS
Peter Lesica	Range management consultant	Independent consultant
Brian McGlynn	Professor, watershed hydrology	Montana State University
Jim Mogen	Fisheries biologist	USFWS
Jana Mohrman	Hydrologist	USFWS
Deb Parker	Writer and editor	USFWS
Ken Pierce	Geologist emeritus	USGS
David Redhorse	<i>Former</i> Native American liaison	USFWS
Jay Rotella	Professor of ecology	Montana State University
Dean Rundle	Refuge supervisor	USFWS
Rick Schroeder	Wildlife biologist	USGS
Richard Sodja	Wildlife biologist	USGS
Michael Spratt	Chief, Division of Refuge Planning	USFWS
Meg Van Ness	Regional archeologist	USFWS
Brant Loflin	Zone archeologist	USFWS

Appendix E

Environmental Compliance

Environmental Action Statement

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy act and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record.

I have determined that the action of implementing the "Comprehensive Conservation Plan—Red Rock Lakes National Wildlife Refuge" found not to have significant environmental effects, as determined by the attached "finding of no significant impact" and the environmental assessment as found with the draft comprehensive conservation plan.

 6/15/09

Steve Guertin
Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, CO

Date

 6/15/09

Dean Rundle
Refuge Supervisor, Region 6
U.S. Fish and Wildlife Service
Lakewood, CO

Date

 6/10/09

Richard A. Coleman, PhD
Assistant Regional Director, Region 6
National Wildlife Refuge System
U.S. Fish and Wildlife Service
Lakewood, CO

Date

 6/5/09

Bill West
Refuge Manager
Red Rock Lakes
National Wildlife Refuge
Lima, MT

Date

Finding of No Significant Impact

U.S. Fish and Wildlife Service, Region 6
Lakewood, Colorado

Four management alternatives for Red Rock Lakes National Wildlife Refuges were assessed as to their effectiveness in achieving the refuges' purposes and their impacts on the human environment.

- Alternative A, the “no-action” alternative, would continue current management.
- Alternative B acknowledges the importance of naturally functioning ecological communities on the refuge. However, alternations of the landscape (such as creating and modifying wetlands, impounding and diverting water, invasive species) prevent managing the refuge solely as a naturally functioning ecological community. Some of these changes have been significant and will require “hands on” management actions during the life of this plan, including the continued treatment of invasive species. Two created ponds would be restored to naturally functioning riparian areas, providing spawning habitat for one of the last known endemic populations of adfluvial Arctic grayling in the contiguous United States. The remaining wetlands would be maintained, managed, and protected for the benefit of migratory birds, including trumpeter swans. The refuge management actions would continue to support regional and national plans for federal trust species while continuing to work closely with the state on managing resident wildlife populations. Visitor services programs (such as hunting, fishing, wildlife observation and photography, and outreach and interpretation programs) would be improved and expanded while maintaining the wilderness characteristics of the refuge.
- Alternative C acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on allowing wetland and riparian habitats to function naturally through the restoration of all created and modified wetlands and elimination of water diversions. The refuge would continue to support regional and national plans for federal trust species, including the trumpeter swan. Visitor services programs (such as hunting, fishing, wildlife observation and photography, and environmental education, outreach, and interpretation programs) would be improved and expanded while maintaining the wilderness characteristics of the refuge.
- Alternative D acknowledges the importance of a naturally functioning ecosystem. Management action emphasis would be placed on the restoration of all natural processes, including the restoration of wetland and riparian habitats. The refuge would continue to support regional and national plans for federal trust species, including the trumpeter swan. The refuge would place emphasis on creating a wilderness setting in all areas away from refuge headquarters. Visitor services programs would promote a wilderness experience with little to no signage and interpretation.

Based on this assessment and comments received, I have selected alternative B as the preferred alternative for implementation. The preferred alternative was selected because it best meets the purposes for which Red Rock Lakes National Wildlife Refuge was established and is preferable to the “no-action” alternative in light of physical, biological, economic, and social factors. The preferred alternative will continue to provide public access for wildlife-dependent recreation at Red Rock Lakes National Wildlife Refuge (hunting, fishing, wildlife observation, photography, environmental education, and interpretation).

I find that the preferred alternative is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

The following is a summary of anticipated environmental effects from implementation of the preferred alternative:

- The preferred alternative will not adversely impact endangered or threatened species or their habitat.
- The preferred alternative will not adversely impact archaeological or historical resources.
- The preferred alternative will not adversely impact wetlands nor does the plan call for structures that could be damaged by or that would significantly influence the movement of floodwater.

- The preferred alternative will not have a disproportionately high or adverse human health or environmental effect on minority or low-income populations.
- The state of Montana has been notified and given the opportunity to review the comprehensive conservation plan and associated environmental assessment.



Steve Guertin

Date

Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, CO

Appendix F

Compatibility Determinations

Refuge Name: Red Rock Lakes National Wildlife Refuge

Date Established: April 22, 1935

ESTABLISHING AND ACQUISITION AUTHORITIES

- Executive Order 7023, April 22, 1935
- Executive Order 7172, September 4, 1935
- 16 U.S.C. § 715d (Migratory Bird Conservation Act)
- 16 U.S.C. § 460k-2 (Refuge Recreation Act) (16 U.S.C. § 460k-460k-4), as amended
- 16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986)
- 16 U.S.C. § 742f(a)(4) and 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956)
- 16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act)

REFUGE PURPOSES

- “As a refuge and breeding ground for wild birds and animals.” (Executive Order 7023)
- “For use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” (16 U.S.C. § 715d (Migratory Bird Conservation Act))
- “Suitable for—(1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ... The Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors.” (16 U.S.C. § 460k-1, k-2 (Refuge Recreation Act) (16 U.S.C. § 460k-460k-4), as amended))
- “The conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions.” (16 U.S.C. § 3901(b) (Emergency Wetlands Resources Act of 1986))

- “For the development, advancement, management, conservation, and protection of fish and wildlife resources ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude.” (16 U.S.C. § 742f(a)(4), (b)(1) (Fish and Wildlife Act of 1956))
- “Conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans.” (16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act))
- “Wilderness areas ... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.” (16 U.S.C. § 1131 (Wilderness Act))

NATIONAL WILDLIFE REFUGE SYSTEM MISSION

The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE: BIG GAME HUNTING

Hunting in the Centennial Valley is a traditional form of wildlife-dependent recreation. Waterfowl hunting has been allowed on the refuge since its establishment. However, big game hunting on the

refuge was not allowed until 1952 when a limited moose hunt was initiated. This limited hunt occurred until 1958. From 1959 to 1962, the only hunting allowed on the refuge was for waterfowl. A very limited pronghorn hunt was allowed in 1963 in the northeastern corner of the refuge. This hunt area was expanded in 1964 to include all refuge lands on the north side of the refuge (north of Lower Lake, River Marsh area and Upper Lake). In 1965 hunting of waterfowl, elk, deer, pronghorn, and moose was allowed on the refuge. The hunt was separated in space with waterfowl hunting occurring on Lower Lake, deer and elk hunting occurring south of South Valley Road (Red Rock Pass Road), pronghorn hunting occurring on the north side of the refuge (north of River Marsh, and Upper and Lower Red Rock lakes), and moose hunting occurring in the southeastern corner of the refuge (also known as the willow fen area). Big game and waterfowl hunting have continued on the refuge, using various scenarios of time and space separation to manage potential and observed conflicts.

Red Rock Lakes National Wildlife Refuge proposes to continue and expand opportunities for big game hunting that are compatible with refuge purposes. Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997. Hunting of deer (white-tailed and mule), pronghorn, elk, and moose will be permitted in designated hunting areas on the refuge. Hunting will be conducted in accordance with Montana state regulations and refuge-specific regulations. When appropriate, zoning (utilizing time and space separation) will be used to resolve conflicts with other user groups.

The refuge big game hunting program objectives are to (1) control and maintain ungulate populations at a level that is compatible with plant and wildlife animal communities on the refuge (for example, to prevent over-browsing of willow communities), and (2) provide the public with high-quality wildlife-oriented recreation. Managing elk will also have a beneficial impact on plant communities outside of the refuge.

The refuge proposes to expand opportunities to hunt deer, elk, and pronghorn on the refuge. The hunting area will be delineated by physical features (such as roads and creeks). To create a contiguous hunting area and eliminate hunting boundary confusion, moose hunting will be opened throughout the area west and north of South Valley Road (Red Rock Pass Road), and north to Elk Springs Creek. The area south of South Valley Road will be closed to moose hunting to eliminate a road hunting issue. Areas in the northern section of the refuge will be opened to deer, elk, and pronghorn hunting. The refuge will address illegal road hunting by adopting a regulation that no big game hunting will be permitted within 50 yards of the center line of any county or refuge road.

Seasons and regulations vary for each big game species. The refuge will continue the practice of opening moose hunting later than the state season, around mid-October. In collaboration with MFWP, this hunting season may be modified (lengthened or shortened further) in the future to meet habitat and population objectives. Refuge staff estimate 800 hunter visits during the big game season. Hunting pressure varies but is usually heaviest during the opening of each season.

Access will be on foot for a majority of the area because most of the hunting area exists in Red Rock Lakes Wilderness. However, stock animals will be allowed south of South Valley Road (Red Rock Pass Road), mainly to allow access into the Centennial Mountains. Stock may be used in order to retrieve big game on the refuge. Stock may not be used in areas north of the South Valley Road (Red Rock Pass Road) except for retrieval purposes. There will be one accessible blind downriver from Lower Lake.

AVAILABILITY OF RESOURCES

Adequate funding exists to administer the big game hunt program. The refuge will require one existing or proposed staff person to maintain law enforcement credentials. In addition, existing law enforcement partnerships with the Bureau of Land Management and Montana Fish, Wildlife and Parks will continue.

ANTICIPATED IMPACTS OF USE

The direct effects of hunting on big game include mortality, wounding, and changes in distribution. However, regulated big game hunting has been used as a management tool to control ungulate populations, which helps ensure high-quality habitats. This results in healthy individuals and populations of big game species. In addition, it is well recognized that hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Despite the potential negative impacts of hunting, a goal of the refuge is to provide opportunities for quality wildlife-dependent recreation. By law, hunting is one of the six priority public uses of the National Wildlife Refuge System. The key focus is to offer a safe quality program and maintain adverse impacts within acceptable limits.

Hunting on the refuge does affect big game movements, distribution, and behavior. Big game species will likely spend more time in wooded habitats during the day as well as in closed areas (regardless of habitat type) on the refuge. Hunting also increases agitation, nervousness, and energetic expenditures associated with running from hunters

and the sounds of weapons being fired. Changing the areas where hunting is allowed from one year to the next may increase these impacts because big game would have to learn where the “safe zones” are every year. This will also negatively impact wildlife viewing opportunities because there may not be a particular area each year where big game animals will congregate. Areas on the refuge that have traditionally been closed to hunting provide some of the best big game viewing opportunities to see white-tailed deer, elk, and moose. Big game animals typically congregate in these closed areas.

Direct negative impacts of big game hunting on other wildlife will be minimal because hunting occurs in the fall when breeding and nesting seasons are over. Most land birds and many of the waterfowl have migrated out of the valley when peak big game hunting occurs. Other birds (such as owls, ravens, and magpies) do remain in the area during hunting season; these species of birds actually benefit from the added forage created by the remains of harvested animals. Any disturbance impacts on most predators and scavengers will probably be outweighed by this increase in food in the form of gut piles and carcass remains.

Recreational hunting activities may, in some cases, result in competition for limited resources (such as preferred campsites or use areas) between hunters and other refuge users. However, campsites are typically available even during the peak of hunting season. In addition, a portion of the areas closed to hunting are still open to other wildlife-dependent recreation activities such as wildlife viewing and wildlife photography. Some big game animals tend to congregate in the closed areas. This behavior may ultimately provide refuge visitors with increased opportunities to view animals such as moose, elk, and deer. However, the aesthetic value of viewing may be diminished by the occasional sound of gunshots.

DETERMINATION

Recreational big game hunting is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

The refuge big game hunt program will be designed to provide quality experiences. A quality hunt experience means that

- hunters are safe;
- hunters exhibit high standards of ethical behavior;
- hunters are provided with uncrowded conditions;
- hunters have reasonable harvest opportunities;
- hunters are clear on which areas are open and closed to hunting;

- minimal conflicts occur between hunters and other visitors, especially those engaging in wildlife-dependent priority public uses.

The hunt program will include the following restrictions to reduce impacts:

- A limited hunt area (areas will be posted and enforced).
- Use of stock animals to retrieve game.
- Use of stock animals south of South Valley Road (Red Rock Pass Road) to access other areas of the Centennial Mountains.
- Periodic biological and social monitoring and evaluation of the hunting program, including feedback from users to determine if objectives of a quality experience are being met.
- To address illegal road hunting, no big game hunting will be permitted within 50 yards of the center line of any county or refuge road.
- When the area open to big game hunting is expanded, special restrictions may be enforced to ensure the expanded hunting activities are conducted in a safe and ethical manner. This may include limiting the number of big game hunters, modifying hunting dates, and changing the method of harvest. This new hunting area includes the area north of South Valley Road, south of Red Rock Creek and west of Upper Red Rock Lake to the west boundary of the refuge.
- The refuge will continue to partner with MFWP to limit the number of moose hunters. Only eleven moose hunters are currently allowed in Hunting District 334, which encompasses the refuge.
- The refuge will continue the practice of opening moose hunting later than the state season. In collaboration with MFWP, this hunting season may be modified (lengthened or shortened further) in the future to meet habitat and population objectives.

Hunter compliance with current state big game and refuge-specific regulations will be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by law enforcement officers.

JUSTIFICATION

Hunting is one of the six priority public uses of the National Wildlife Refuge System. Providing for a quality hunting program contributes to achieving one of the refuge goals. This program as described was determined to be compatible in view of the potential impacts that hunting, camping, and use of stock animals can have on the Service’s ability to achieve refuge purposes and goals. The refuge will be opened to big game hunting, with sufficient restrictions in place on hunting, use of stock

animals, and other visitor services to ensure a quality hunting program.

Refuge hunt programs are designed to provide quality experiences. In general, hunting on refuges should be superior to that available on other public lands, which may require special restrictions (Refuge Manual 8RM5). Measures are often used to ensure quality. The restricted hunt program is proposed on the refuge to (1) provide a quality hunting experience that meets refuge guidelines and policies, (2) prevent conflicts with other priority wildlife-dependent public uses, and (3) control and maintain ungulate populations at a level that is compatible with plant and wildlife animal communities on the refuge and meets habitat objectives (for example preventing over-browsing of willow communities) outlined in the refuge's comprehensive conservation plan.

The hunting areas provide distinct, manageable units that can be easily delineated and enforced. It is anticipated that big game will find sufficient food resources and resting places, both inside and outside of the hunt area; the physiological condition of big game and other wildlife species will not be impaired; and their overall state and national population status will not be impaired, that is, the species will not be in jeopardy of becoming federally threatened or endangered.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: WATERFOWL HUNTING

The Red Rock Lakes National Wildlife Refuge Comprehensive Conservation Plan proposes to continue to provide limited opportunities for waterfowl hunting (a wildlife-dependent recreation) that are compatible with the refuge's purpose. Hunting is identified as a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Improvement Act of 1997. Hunting of waterfowl (limited to coots, ducks, and geese) will be permitted in a designated hunting area on and surrounding the Lower Red Rock Lake (also known as Lower Lake) and River Marsh area.

Hunting will be consistent with annual Montana state hunting regulations and seasons, as well as applicable specific refuge and federal regulations. The waterfowl hunting season generally falls within the period from October through early January. However, waterfowl hunting on the refuge typically does not occur after October because all water is frozen, and very few waterfowl remain in the area. There will be no limit on the number of hunters and hunt days and one accessible blind site downriver of the Lower Lake water control structure (WCS) will be available. Refuge staff estimate 300 hunter visits during the waterfowl season. A majority of hunter visits occur on the first two weekends of the

year. Hunting pressure is almost nonexistent during weekdays and after the second weekend of the hunting season.

Access will be on foot and by nonmotorized boats for a majority of the area because most of the hunting area exists in Red Rock Lake Wilderness. However, motorized boats will be allowed from the Lower Red Rock Lake WCS downstream on Red Rock Creek. During the hunting season, hunting dogs will be allowed off leash and under voice control for the purpose of retrieving waterfowl.

AVAILABILITY OF RESOURCES

Adequate funding exists to administer the waterfowl hunt program. One existing or proposed staff person will be required to maintain law enforcement credentials. In the interim, law enforcement assistance is available during periods of heavy use. The Service will also continue to maintain its enforcement partnerships with the Bureau of Land Management and Montana Fish, Wildlife and Parks.

ANTICIPATED IMPACTS OF USE

Adequate funding exists to administer the waterfowl hunt program. There is currently no law enforcement staff on-site. There is some law enforcement presence during periods of heavy use. Partnerships have been developed with the Bureau of Land Management and Montana Fish, Wildlife and Parks to assist with law enforcement needs. This plan does propose adding law enforcement capabilities for the staff.

By its very nature, waterfowl hunting has very few, if any, positive effects on waterfowl and other birds while the activity is occurring. However, it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. Furthermore, despite the potential impacts of hunting, a goal of the refuge is to provide opportunities for quality wildlife-dependent recreation. By law, hunting is one of the six priority public uses of the National Wildlife Refuge System. A key concern is to offer a safe and quality program and to keep adverse impacts within acceptable limits.

Although hunting directly impacts individual birds, the amount of waterfowl harvest is not expected to have a measurable effect on refuge, national or international populations, especially since waterfowl hunting activity is extremely limited (in time and space) on the refuge. For example, the refuge staff estimates that approximately 300 hunter visits are made annually to the refuge. Over the entire season, the average hunter visit per day will be approximately 3.0 during an average season. However, since Lower Red Rock Lake freezes up around November 1, the average on the refuge is probably closer to 9.1 hunter visits per day. Hunting

may be either compensatory or additive to natural mortality (Anderson 1995). Compensatory mortality occurs when hunting substitutes for other forms of mortality (such as disease, competition, predation, and severe weather). Additive mortality occurs when hunting compounds the total mortality. In some cases, hunting can be used as a management tool to control populations. In concert with Canada, Mexico, and multistate flyway councils, the Service and Montana Fish, Wildlife and Parks regulate hunting so that harvest does not reduce populations to unsustainable levels.

Direct effects of hunting on waterfowl are mortality, wounding, and disturbance (DeLong 2002). Hunting can alter behavior (such as foraging time), population structure, and distribution patterns of wildlife (Bartelt 1987, Cole and Knight 1990, Madsen 1985, Owens 1977, Raveling 1979, Thomas 1982, White-Robinson 1982). In Denmark, hunting was documented to affect the diversity and number of birds using a site (Madsen 1995). Bird diversity changed from predominantly mute swan and mallard to a more even distribution of a greater number of species when a sanctuary was established. Hence, species diversity increased with the elimination of hunting. There also appears to be an inverse relationship between the number of birds using an area and hunting intensity (DeLong 2002). In Connecticut, lesser scaup were observed to forage less in areas that were heavily hunted (Cronan 1957). In California, the numbers of northern pintails on Sacramento National Wildlife Refuge nonhunt areas increased after the first week of hunting and remained high until the season was over in early January (Heitmeyer and Raveling 1988). Following the close of hunting season, ducks generally increased their use of the hunt area; however, use was lower than before the hunting season began.

Human disturbance to staging birds and other wildlife using the open waters and marshes on the refuge will occur as a result of hunting activity. Migratory and wintering waterfowl generally attempt to minimize time spent in flight and maximize foraging time because flight requires considerably more energy than any other activity, other than egg laying. Human disturbance associated with hunting includes loud noises and rapid movements, such as those produced by shotguns and boats powered by motors. This disturbance, especially when repeated over a period of time, compels waterfowl to change food habits, feed only at night, lose weight, or desert feeding areas (Belanger and Bedard 1990, Madsen 1995, Wolder 1993). Disturbance levels from hunting activity outside Chincoteague National Wildlife Refuge were found to be high enough to force wintering black ducks into a pattern of nocturnal feeding within surrounding salt marshes and diurnal resting within refuge impoundments (Morton et al. 1989a, 1989b). Unhunted populations have been documented to behave differently from hunted ones (Wood 1993).

These impacts can be reduced by the presence of sanctuary areas where hunting does not occur, and birds can feed relatively undisturbed. Sanctuaries or nonhunt areas have been identified as the most common solution to disturbance problems caused from hunting (Havera et al. 1992). Prolonged and extensive disturbances may cause large numbers of waterfowl to leave disturbed areas and migrate elsewhere (Madsen 1995, Paulins 1984). In Denmark, hunting disturbance effects were experimentally tested by establishing two sanctuaries (Madsen 1995). Over a 5-year period, these sanctuaries became two of the most important staging areas for coastal waterfowl. Numbers of dabbling ducks and geese increased four- to twenty-fold within the sanctuary (Madsen 1995). Thus, sanctuary areas are very important to minimize disturbance to waterfowl populations to ensure their continued use of the refuge.

Intermittent hunting can be a means of minimizing disturbance, especially if rest periods in between hunting events are weeks rather than days (Fox and Madsen 1997). It is common for refuges with heavily used hunt programs to manage their programs with nonhunt days. At Sacramento National Wildlife Refuge, 3%–16% of northern pintails were located in hunt units during nonhunt days, but they were almost entirely absent in those same units on hunt days (Wolder 1993). In addition, northern pintails, American wigeon, and northern shovelers decreased time spent feeding on days when hunting occurred on public shooting areas, as compared to nonhunt days (Heitmeyer and Raveling 1988). However, intermittent hunting may not always greatly reduce hunting impacts. At Sacramento National Wildlife Refuge, the intermittent hunting of three hunt days per week results in lower northern pintail densities on hunt areas during nonhunt days than establishing nonhunt areas (Wolder 1993). In Germany, several studies reported a range from a few days to approximately 3 weeks for waterbird numbers to recover to pre-disturbance levels (Fox and Madsen 1997). The proposed hunt program at Red Rock Lakes National Wildlife Refuge will not be intermittent due to the limited nature of the hunting season, limited use that occurs during weekdays, and the limited amount of area that is open to hunting.

Boating activity associated with hunting during the fall can alter distribution, reduce use of particular habitats or entire areas by waterfowl and other birds, alter feeding behavior and nutritional status, and cause premature departure from areas (Knight and Cole 1995). In the upper Midwest, motor boating and hunting have been found to be the two main activities that disturb waterfowl (Korschgen et al. 1985). In Connecticut, selection of feeding sites by lesser scaup was influenced by disturbances from hunters, anglers, and pleasure boats (Cronan 1957). In Germany, boat pressure on wintering waterfowl had reached such a high level that it was necessary to establish larger sanctuaries, implement a seasonal

closure on water sports and angling, and impose a permanent ban on hunting (Bauer et al. 1992). Impacts of boating can occur even at low densities, given their noise, speed, and ability to cover extensive areas in a short amount of time. However, impacts from boating at Red Rock Lakes National Wildlife Refuge will be greatly reduced because a majority of the proposed hunting area will be open only to nonmotorized boating. Thus, much of the disturbance impacts (identified above due to quick movements, noise, and the ability to cover large areas in a short amount of time) will not apply to this refuge. As such, the use of nonmotorized boats is one way of minimizing disturbance to waterbirds at this refuge. In addition, allowing only nonmotorized boating on a majority of the hunting area provides for a very unique experience not easily found in southwest Montana. Each year, the refuge staff receives comments from hunters who specifically come to this refuge because of the nonmotorized regulations.

Additional impacts from hunting activity include conflicts with individuals participating in other wildlife-dependent priority public uses, such as canoeing, kayaking, and wildlife observation. However, the refuge currently provides a minimum of 3,200 acres of wetlands that are closed to hunting, but open to nonmotorized boating and wildlife observation. In addition, approximately 4,500 acres of upland habitat is closed to hunting but open for visitors to participate in wildlife observation activities on foot.

DETERMINATION

Waterfowl hunting is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

The refuge's waterfowl hunt program will be designed to provide quality experiences. A quality hunt experience means that

- hunters are safe;
- hunters exhibit high standards of ethical behavior;
- hunters are provided with uncrowded conditions;
- hunters have reasonable harvest opportunities;
- hunters are clear on which areas are open and closed to hunting;
- minimal conflicts occur between hunters and other visitors, especially those engaging in wildlife-dependent priority public uses.

The hunt program will include the following restrictions to reduce impacts:

- a limited hunt area
- use of nonmotorized boats, except downstream (west) of the Lower Red Rock Lake WCS
- use of closed areas, as needed, to provide sufficient feeding and resting habitat for waterfowl
- periodic biological and social monitoring and evaluation of the hunting program, including feedback from users to determine if the objectives for a high-quality experience (as defined above) are being met

Hunter compliance with current migratory bird and refuge regulations will be achieved through a combination of printed information, signing, outreach efforts, and enforcement of regulations by law enforcement officers.

JUSTIFICATION

Hunting is one of the six priority public uses of the National Wildlife Refuge System. Providing for a quality hunting program contributes to achieving one of the refuge goals. This program as described was determined to be compatible, in view of potential impacts that hunting and supporting activities (boating) can have on the Service's ability to achieve refuge purposes and goals. The refuge will be opened to waterfowl hunting, with sufficient restrictions in place on hunting, boating, and other public uses to ensure that an adequate amount of quality feeding and resting habitat would be available in relatively undisturbed areas (sanctuaries) for a majority of waterfowl and other wetland birds using the refuge.

Refuge hunt programs are designed to provide high-quality experiences. In general, hunting on refuges should be superior to that available on other public lands, which may require special restrictions (Refuge Manual 8RM5). Measures are often used to ensure quality. The limited hunt program is proposed on the refuge to (1) provide a quality hunting experience that meets refuge guidelines and policies, (2) provide sufficient waterfowl sanctuary, and (3) prevent conflicts with other priority wildlife-dependent public uses.

Consolidation of the hunting area into a single block of land provides a distinct, manageable unit that can be easily delineated, and enforced. It is anticipated that birds will find sufficient food resources and resting places, both inside and outside the hunt area, such that their abundance and use of the refuge will not be measurably lessened, hunting pressure will not cause premature departure from the area, the physiological condition of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall population status will not be impaired.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: RECREATIONAL FISHING

Recreational fishing (a wildlife-dependent activity) has been identified in the National Wildlife Refuge System Improvement Act of 1997 as a priority public use, provided it is compatible with the purpose for which the refuge was established. An establishment authority for Red Rock Lakes National Wildlife Refuge, the Refuge Recreation Act, provides for “incidental fish and wildlife-oriented recreational development.”

Currently, fishing is allowed on Odell, Red Rock, and Elk Springs (west of Elk Lake Road) creeks under state river and stream seasons. Culver, Widgeon, and MacDonald ponds, and Elk Springs Creek (east of Elk Lake Road) are open seasonally (July 15–October 1). All other refuge waters are closed to fishing to protect breeding waterfowl and trumpeter swans. Game fish include native Westslope cutthroat trout (although mostly hybridized with nonnatives), Arctic grayling, and limited mountain whitefish. Nonnative game species include brook, Yellowstone cutthroat, and rainbow trout. There are unimproved parking areas at the ponds. Vehicle access points with minimal parking exist at two locations on Red Rock Creek and one each at Elk Springs and Odell creeks. Commercial guiding is not allowed.

Anglers must use nontoxic artificial lures or flies. Lead sinkers are prohibited. Fishing with bait is not permitted in order to reduce introduction of nonnative invasive species and increase the survival of released native fish. The refuge has not collected data on fishing use. From observations, Red Rock Creek receives the greatest fishing pressure. There is the potential for some Arctic grayling mortality due to such things as trampling of eggs and catch and release fishing. To minimize future impacts on Arctic grayling from fishing, no additional parking areas will be created.

The refuge does not stock nonnative fish species to protect Arctic grayling populations. A primary objective of the comprehensive conservation plan is to restore Arctic grayling and Westslope cutthroat trout populations. While refuge streams will be open in compliance with state regulations, fishing closures in target creeks and ponds may be implemented while restoration work is being completed.

The comprehensive conservation plan proposes the following fishing opportunities:

- Until the structures are removed from Culver and MacDonald ponds, and the Arctic grayling fishery is restored to these areas and also to Widgeon Pond, all three will be open under state river and stream regulations to fishing from the bank, unless closure is necessary to protect nesting swans or adfluvial Arctic grayling restoration efforts.

- All refuge streams will be open to fishing in compliance with refuge, and the state’s river and stream regulations.
- To protect native Arctic grayling and Westslope cutthroat populations, visitors will be encouraged to keep all nonnative fish they catch in accordance with state regulations.
- Red Rock Creek west of the Lower Lake WCS will be opened to fishing.

AVAILABILITY OF RESOURCES

Sufficient resources are available at the current levels of fishing pressure. The refuge will continue to work with Montana Fish, Wildlife and Parks to conduct fish and creel surveys.

ANTICIPATED IMPACTS OF USE

Fishing and other human activities cause disturbance to wildlife. This disturbance may have cumulative impacts on wildlife, habitat, and the fisheries resource. This includes more disturbances to wildlife, vegetation trampling, potential introduction and spread of aquatic nuisance species and invasive terrestrial plants, potential transmission of diseases including whirling disease, problems associated with disposal of human waste, and deposition of lead sinkers and fishing line. Birds or mammals feeding or resting may be disturbed by anglers fishing from the bank. The current visitor use is usually low enough that disturbance by anglers causes minimal impacts on most wildlife species. Opening the remaining creeks on the refuge to fishing should not impact Arctic grayling because they have not been found during surveys outside of Odell and Red Rock creeks. Educational efforts will be implemented to inform visitors to inspect, clean, and dry fishing equipment to prevent the spread of aquatic nuisance species.

DETERMINATION

Recreational fishing is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- To protect migratory waterbirds, fishing is not allowed on Swan Lake, Lower and Upper Red Rock lakes, and River Marsh between Upper and Lower Red Rock Lake.
- Fishing on the creeks is open according to Montana state river and stream seasons.
- Until the structures are removed from Culver and MacDonald ponds, and the Arctic grayling fishery is restored to these areas and also to Widgeon Pond, all three will be open under state river and stream regulations unless closure is necessary to protect nesting swans or Arctic grayling restoration efforts.

- Anglers must use nontoxic artificial lures or flies.
- Lead sinkers are prohibited.
- Fishing with bait is not permitted.
- The harvest of nonnative game fish species is promoted.
- Commercial guiding is not permitted.
- Existing use is monitored to ensure that disturbance to wildlife continues to be minimal.
- Existing signage is improved or replaced.

JUSTIFICATION

Based upon the biological impacts described above and in the environmental assessment, it is determined that recreational fishing within Red Rock Lakes National Wildlife Refuge will not materially interfere with or detract from the purposes for which the refuge was established. One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for public fishing when compatible, and it is identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997. Current recreational fishing at the refuge will support this goal with only minimal conflicts with the wildlife conservation mission of the Refuge System.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: WILDLIFE OBSERVATION AND PHOTOGRAPHY

Wildlife observation and photography are major public uses at the refuge. The beauty and uniqueness of the area combined with the abundance of various bird and mammal species draw over 12,000 visitors each year. The refuge will continue to support and enhance opportunities related to wildlife observation and photography. Supporting uses to assist visitors in wildlife observation and photography are vehicle access, foot access (including hiking trails), campgrounds, nonmotorized boat, and bicycle access. These supporting uses (access) will be controlled and regulated through the publication of refuge brochures and through information posted at the kiosks.

Wildlife observation and photography are two of the six wildlife-dependent recreational uses specified in the Improvement Act.

Wildlife observation and photography will be allowed across most of the refuge, with the exception of the closure of Shambow Pond and the area surrounding the residences, shop, and equipment yard.

Foot travel, including hiking, snowshoeing, and cross-country skiing, is permitted throughout the refuge except for the above-mentioned closed areas.

Passenger vehicles, motorcycles and bicycles will be restricted to county and public refuge roads. Seasonal road closures, due to weather, limit access during the winter and spring months. Snowmobiles are not permitted on refuge roads and are allowed only on county roads. All-terrain vehicles (ATVs) must be licensed for highway use to be able to operate on county and refuge roads.

Nonmotorized boat access is seasonally allowed on Red Rock Creek, Upper and Lower Red Rock lakes and River Marsh which connects the two lakes. Boating access is difficult if a drought persists due to the shallowness of the lakes. Sailing is not permitted.

Horses, mules, llamas, and other animals used for riding or packing are permitted only for access into mountainous areas south of South Valley Road (Red Rock Pass Road).

The CCP proposes to continue the above uses and add the following to improve wildlife observation and wildlife photography:

- Update and improve refuge signs and brochures.
- Develop an auto tour route.
- Investigate the development of accessible habitat specific wildlife-viewing/photography areas, infrastructure or trails.
- Work with the county road department to provide accessible pulloffs for the safe viewing of wildlife and photography.
- Build one accessible photography/waterfowl hunting blind downstream from the Lower Red Rock Lakes WCS.

AVAILABILITY OF RESOURCES

Developing new facilities outlined in the comprehensive conservation plan is closely tied to funding requests in the form of the refuge operation needs system and the maintenance management system projects. Existing programs such as current refuge directional signs and brochures can be updated with available resources.

ANTICIPATED IMPACTS OF USE

Wildlife observation and photography can affect wildlife resources positively or negatively. A positive effect of public involvement for these priority public uses will be a better appreciation and more complete understanding of the refuge's wildlife and habitats. That can translate into widespread and stronger support for the refuge, Refuge System, and the Service.

Walking and hiking is expected to minimally disturb wildlife and wildlife habitat at the current and proposed levels. Increased disturbance to wildlife will occur in areas regularly frequented by visitors,

such as the campgrounds and trails. During snow-free months, the majority of visitors restrict their pedestrian use to the trails and parking areas, which concentrates these uses along the road system, minimizing disturbance to wildlife and habitats. The majority of bird species migrate out of the area in the winter months. Elk, pronghorn, and mule deer also tend to leave the valley. Winter pedestrian travel will have little to no impact on other species because of the inaccessibility of the refuge. White-tailed deer and moose around the headquarters are disturbed more frequently in the winter from pedestrian travel but can easily move away from those visitors who are snowshoeing or skiing.

Vehicular access, while restricted to the roads, allows visitors to cover more ground, potentially increasing the number of times an animal is disturbed, but it may be of shorter duration compared to pedestrian disturbance. Wildlife disturbance, especially impacts to moose from snowmobiles traveling through the refuge has not been studied. Snowmobiles are restricted to the county roads. Snowmobile use on the South Valley Road to Elk Lake Road is low at this time. The use may dramatically increase if a resort business opens up in Lakeview in the near future. Snowmobile use through the refuge on Elk Lake Road is relatively high (average 30 snowmobiles/day). These visitors come from West Yellowstone and go up to Elk Lake Resort for lunch. This use needs to be monitored for impacts on wildlife.

Nonmotorized boating is restricted to Red Rock Creek and Upper Red Rock Lake from July 1 to freeze-up. Lower Red Rock Lake and River Marsh which connects the two lakes are open September 1 to freeze-up. Kayaks and canoes are the typical nonmotorized boats used. Wildlife disturbance from human-powered boating displaces birds from the immediate area of the visitors. The slow speeds of the boats and large size of the lakes allow the birds to easily move to another area without further disturbance. This use needs to be monitored for impacts on wildlife. Educational efforts will be implemented to inform visitors to inspect, clean, and dry boating equipment to prevent the spread of aquatic nuisance species.

No cultural resources will be impacted. No impact on endangered species should occur.

There may be temporary disturbance to wildlife near the activity. Direct short-term impacts may include minor damage from traffic on refuge roads and trails when wet and muddy. Temporary disturbance may occur due to facility improvements. However, suitable habitats exist nearby and effects on wildlife will be minor and nonpermanent.

The Service does not expect substantial cumulative impacts from these two priority uses in the near term, but it will be important for refuge staff to

monitor these uses and, if necessary, respond to conserve high-quality wildlife resources.

Refuge staff, in collaboration with volunteers, will monitor and evaluate the effects of these priority public uses to discern and respond to any unacceptable impacts on wildlife or habitats. To mitigate those impacts, the refuge will close areas where birds such as bald eagles, colonial waterbirds, or swans are nesting. The Service expects no additional effects from providing these two priority uses.

DETERMINATION

Wildlife observation and photography are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- Wildlife observation and photography will be allowed across most of the refuge, with the exception of the closure of Shambow Pond and the area surrounding the residences, shop, and equipment yard.
- Foot travel, including hiking, snowshoeing, and cross-country skiing, is permitted throughout the refuge, except for around the residences, shop, equipment yard, and Shambow Pond.
- Passenger vehicles, motorcycles, and bicycles will be restricted to county and public refuge roads. Roads may be closed at any time due to weather and snow conditions. Snowmobiles are not permitted on refuge roads and are restricted to county roads. All terrain vehicles must be licensed for highway use to be able to operate on refuge and county roads.
- Nonmotorized boat access is seasonally allowed on Red Rock Creek, Upper and Lower Red Rock lakes, and River Marsh which connects the two lakes. Boating access is difficult if a drought persists due to the shallowness of the lakes. Sailing is not permitted.
- Horses, mules, llamas, and other animals used for riding or packing are permitted only for access into mountainous areas south of South Valley Road (Red Rock Pass Road).
- An increase in education and law enforcement patrols will minimize illegal or undesirable activity.
- Newly constructed viewing areas will be designed to minimize disturbance impacts on wildlife and all refuge resources while providing a good opportunity to view wildlife in their natural environments.

JUSTIFICATION

According to the National Wildlife Refuge System Improvement Act of 1997, wildlife observation and photography are priority public use activities that should be encouraged and expanded where possible. It is through compatible public uses such as this that the public becomes aware of and provides support for refuges.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: ENVIRONMENTAL EDUCATION AND INTERPRETATION

Environmental education and interpretation are both defined as wildlife-dependent recreational uses under the Improvement Act. Currently these programs have been opportunistic as time and staff allows. School group participation in environmental education can be limited due to road conditions and distance from communities. A few organized groups request tours and talks during the summer months. Interpretation is limited to brochures, information panels inside the headquarters visitor contact station, two standalone panels, and four kiosks. In addition, the refuge does not have an auto tour route or interpretation along current roads or designated trails.

The comprehensive conservation plan proposes to continue with the above uses, and add the following to improve environmental education and interpretation:

- Hire a temporary visitor services technician to develop and carry out environmental education and interpretive programs.
- The refuge website will be expanded to include educational tools, including Centennial Valley resource information, classroom projects, and online exercises.
- Update refuge signs and brochures, identifying public trails and roads.
- Develop and interpret an auto tour route along roads currently open to the public.
- Replace three existing kiosks, add one new kiosk, and update all interpretive panels.
- Improve Sparrow Pond Trail so it is an accessible trail.

AVAILABILITY OF RESOURCES

Funding for these activities is supported solely by annual operation and maintenance money. Resources are stretched in order to continue providing environmental education and interpretation at the refuge. Implementing new facilities outlined in the comprehensive conservation plan is closely tied to funding requests in the form of the refuge operation needs system and the maintenance management

system projects. Existing programs such as current refuge directional signs and brochures can be updated with available resources.

ANTICIPATED IMPACTS OF USE

The use of the refuge to provide interpretation and environmental education on the refuge may impose a low-level impact on those sites used for these activities. Impacts may include trampling vegetation and temporary disturbance to wildlife species in the immediate vicinity.

DETERMINATION

Environmental education and interpretation use are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

Visitors participating in environmental education and interpretation programs will follow all refuge regulations. On-site activities should be held where minimal impact will occur.

JUSTIFICATION

One of the secondary goals of the National Wildlife Refuge System is to provide opportunities for the public to develop an understanding and appreciation for wildlife when it is found compatible with other goals. The above uses are identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997.

Environmental education and interpretation are used to encourage an understanding in citizens of all ages to act responsibly in protecting wildlife and its habitat. These are tools used in building land ethics, developing support for the refuge, and decreasing wildlife violations.

Environmental education at the refuge is incidental to other programs since there is no full-time staff to conduct these activities. However, the program is important and provides visitors with an awareness of refuge-specific issues such as wetland ecology, migratory bird management, and issues relating to the entire Refuge System.

Based on anticipated biological impacts and in the environmental assessment, it is determined that environmental education and interpretation on the refuge will not interfere with refuge habitat goals and objectives or the purposes for which it was established. Limits to access and monitoring can help mitigate any adverse impacts.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: CAMPING

Red Rock Lakes National Wildlife Refuge manages two primitive campgrounds for visitors participating in wildlife-dependant recreation. Camping is not permitted elsewhere on the refuge. The campgrounds provide opportunities to participate in wildlife-dependent recreation without traveling great distances. Because of the distance to town and limited public land access, the campgrounds are used regularly by visitors who are bird watching, photographing wildlife, fishing, hunting, and hiking or biking the Continental Divide trails. Groups touring the valley and refuge also use the campgrounds for day use.

Camping is permitted year-round, but it primarily occurs from May through October with some use in November. Access to the campgrounds in the winter is limited to travel across snow-covered roads, and the vault toilets are not maintained. Visitors observing and photographing wildlife are the primary users during the summer, with hunters dominating in the fall. Camping is allowed for up to 16 consecutive days. Fires are only allowed in fire rings, and visitors can collect dead and downed material. Garbage must be packed out. Visitors to the campgrounds rarely litter. Food and carcass storage is required to protect grizzly and black bears, and visitors. The refuge will provide bear-proof storage containers for hikers, bicyclists, and motorcyclists, and for hunters to store carcasses.

Upper Lake campground receives the most use by visitors due to its beautiful scenery and location adjacent to the county road. It provides two vault toilets (not accessible), piped spring water, picnic tables (one accessible), and fire rings. The entrance road and all campsites need repairs. There are no hookups, parking, or turnarounds specifically for recreational vehicles (RVs). This limits RVs from using this campground, which provides more campsites for hikers, bicyclists, and vehicle campers. This minimizes conflicts between vehicles using generators and low-impact campers. There are eleven designated sites. There is a boat launch (not accessible) for nonmotorized boats. An informational kiosk is provided to inform the visitor about the refuge and its wildlife. Upper Red Rock Lake is open to nonmotorized boats from July 1 to freeze-up to protect breeding birds.

River Marsh campground provides two vault toilets (not accessible) and fire rings. There are no designated campsites here and it can accommodate RVs. This campground is primarily used during hunting seasons, especially waterfowl hunting because it provides immediate access to open hunt areas. Summer use does occur by wildlife observers who want to get away from the county road. There is a boat launch for nonmotorized boats. Lower Red Rock Lake is open to nonmotorized boats from September 1 to freeze-up to protect breeding birds.

Universally accessible toilets will replace old toilets at both campgrounds, along with an accessible campsite at River Marsh campground. Other improvements, such as food storage containers, picnic tables, fire rings, and road repair, will increase the safety for visitors and the opportunities to use the refuge over multiple days. A recreational fee will be charged to help offset the maintenance of the campgrounds.

AVAILABILITY OF RESOURCES

Existing funding and staffing are adequate to maintain the refuge campgrounds to provide access to wildlife-dependent activities on and off the refuge. During the peak summer months, volunteers maintain the vault toilets, pick up litter, and clean campsites. They also make many contacts with visitors, educating them about the refuge and its wildlife. The campgrounds are both about 4 miles away from headquarters, which allows for easy access to patrol and monitor visitors. Operating the campgrounds as a fee unit will require, at a minimum, one full day a week of staff time for collecting and counting of money and increased law enforcement presence. The refuge contracts the pumping of the vault toilets. The Upper Lake toilets need to be pumped twice a year due to the high use and inadequate size of the vaults. The refuge could reduce pumping needs to once a year or less by replacing the old vault toilets with adequately sized, clean-smelling vault toilets. The new toilets will meet Architectural Barriers Act requirements. This improvement is dependent upon funding from the Visitor Facility Enhancement Program.

ANTICIPATED IMPACTS OF THE USE

Some short-term impacts, such as littering, vegetation trampling, and wildlife disturbance, can be expected, but these are not anticipated to be significant at current or increased levels of camping. This is because the vast majority of visitors travel the long distances over rough roads to enjoy the scenery, outdoors, solitude, and wildlife of the refuge. Isolation buffers the refuge from visitors looking for a party location. Very few problems have occurred with visitors using the campgrounds.

The Upper Lake campground is surrounded by thick vegetation, and visitors tend to watch wildlife within the open areas of the campground and along the county road. Refuge staff regularly receive reports by visitors who see moose, badger, fox, and deer walking through the campground. River Marsh campground is located in open grassland habitat next to Lower Red Rock Lake. Wildlife disturbance primarily impacts waterfowl that move away from the shoreline when there are people present in the campground. The potential for accidental wildfires exists, but with education, the hazard can be reduced or eliminated. If environmental conditions

warrant, burn bans will be put into place to eliminate campfires.

The use of these primitive campsites by through hikers, bicyclists, and motorcyclists on the Contiguous and Great Divide trails will not adversely impact refuge purposes and objectives. This use is at a low level and is not expected to substantially increase over the next 15 years.

DETERMINATION

Camping is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- The refuge will continue to enforce general visitor services regulations which protect habitat and wildlife, and limit disturbance to other refuge visitors.
- The refuge manager may prohibit fires during periods of high fire danger.
- The refuge will continue to provide information to campers.
- Expansion of the campgrounds will not occur.
- A detailed step-down visitor services plan will be completed and will include planned improvements to the existing impacted area within the campgrounds such as placement of new accessible vault toilets, and planned campsite placement.
- Commercial operations will not be allowed to use the campgrounds.

JUSTIFICATION

Camping is not a priority wildlife-dependent recreational use as identified in the National Wildlife Refuge System Improvement Act of 1997. It is, however, an activity in support of other priority uses, such as fishing, hunting, wildlife observation, and photography. It is a policy of the U.S. Fish and Wildlife Service that, “We may allow other activities on refuges, such as camping, to facilitate compatible wildlife-dependent recreation.” (605 FW 1, 1.2B). Camping on the refuge will have limited negative impacts on natural resources when conducted under the above stipulations. To maintain the campground facilities, contact visitors, and administer a recreation fee program will require more time than it has in the past. The refuge will be able to effectively manage this use with a temporary seasonal visitor services technician. Camping, therefore, at its current level of use will not negatively interfere with the purposes of the refuge or the mission of the Refuge system.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: COMMERCIAL FILMING, AUDIO RECORDING, AND STILL PHOTOGRAPHY

Commercial filming is defined as the digital or film recording of a visual image or sound recording by a person, business, or other entity for a market audience, such as for a documentary, television or feature film, advertisement, or similar project. It does not include news coverage or visitor use. Still photography is defined as the capturing of a still image on film or in a digital format.

Red Rock Lakes National Wildlife Refuge and its designated wilderness is an incredibly scenic and beautiful landscape with tremendous opportunities for commercial filming and commercial still photography. The refuge provides an ideal setting for filmmakers and photographers. Each year the refuge staff receives approximately one to five requests to conduct commercial filming or commercial still photography on the refuge. Each request is evaluated on an individual basis, using a number of Department of the Interior, U.S. Fish and Wildlife Service, and National Wildlife Refuge System policies (for example, 43 CFR Part 5, 50 CFR Part 7, 8 RM 16). Commercial filming will be managed on the refuge through the special user permit process (except as described below for certain activities conducted by commercial still photographers—see “Stipulations Necessary to Ensure Compatibility”) to minimize the possibility of damage to cultural or natural resources or interference with other visitors to the area. In addition, much of the refuge is designated wilderness area. A minimum-requirements decision guide will be completed for all commercial filming activities proposed in Red Rock Lakes Wilderness. This process involves determining if an essential task should be conducted in the wilderness area, and then determining the combination of methods, equipment, or administrative practices necessary to successfully and safely administer the refuge and accomplish wilderness management objectives.

The use includes access by groups or individuals in vehicles on roads open to the general public, by nonmotorized boats on refuge waters open to the general public, and on refuge lands open to the general public. In rare cases, access to areas closed to the general public may be permitted through the special use permit process.

AVAILABILITY OF RESOURCES

In general, the refuge will normally incur no expense except administrative costs for review of applications, issuance of a special use permit, and staff time to conduct compliance checks. These costs may be able to be recovered as outlined in a Proposed Rule modifying commercial filming and still photography policy for the several agencies within the Department of the Interior. This Proposed Rule

is currently in the public review process (*Federal Register*, Volume 72, Number 160, dated August 20, 2007).

ANTICIPATED IMPACTS OF THE USE

Wildlife photographers and filmmakers tend to create the largest disturbance impacts of all wildlife observers (Dobb 1998, Klein 1993, Morton 1995). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even a slow approach by wildlife photographers tends to have behavioral consequences on wildlife species (Klein 1993). Other impacts include the potential for photographers to remain close to wildlife for extended periods of time, in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency for photographers with low-power lenses to get much closer to their subjects (Morton 1995). This usually results in increased disturbance to wildlife and habitat, including the trampling of plants. Handling of animals and disturbing vegetation (such as cutting plants, and removing flowers) is prohibited on the refuge.

A special use permit will be denied if the commercial filming, audio recording, or still photography activities are found not to be compatible with refuge purposes.

DETERMINATION

Commercial filming, audio recording, and still photography are compatible uses at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

All commercial filming requires a special use permit.

- Special use permits will identify conditions that protect the refuge's values, purposes, resources; public health and safety, and prevent unreasonable disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to, specifying road conditions when access will not be allowed, establishing time limitations, and identifying routes of access into the refuge. These conditions will be identified to prevent excessive disturbance to wildlife, damage to habitat or refuge infrastructure, or conflicts with other visitor services or management activities.
- The special use permit will stipulate that imagery produced on refuge lands will be made available to the refuge to use in environmental education and interpretation, outreach, internal documents, or other suitable uses. In addition, any commercial products must include appropriate credits to the refuge, the National

Wildlife Refuge System, and the U.S. Fish and Wildlife Service.

- The commercial filming or still photography use must demonstrate a means to extend public appreciation and understanding of wildlife or natural habitats, or enhance education, appreciation, and understanding of the National Wildlife Refuge System, or facilitate outreach and education goals of the refuge. Failure to demonstrate any of these criteria will result in a special use permit being denied.
- Still photography requires a special use permit (with specific conditions as outlined above) if one or more of the following will occur:
 - it takes place at locations where or when members of the public are not allowed.
 - it uses model(s), set(s), or prop(s) that are not part of the location's natural or cultural resources or administrative facilities.
 - the refuge will incur additional administrative costs to monitor the activity.
 - the refuge will need to provide management and oversight to: avoid impairment of the resources and values of the site; limit resource damage; or minimize health and safety risks to the visiting public.
 - the photographer(s) intentionally manipulate(s) vegetation to create a "shot" (for example cutting vegetation to create a blind).
- To minimize impact on refuge lands and resources, the refuge staff will ensure that all commercial filmmakers and commercial still photographers (regardless of whether a special use permit is issued) comply with policies, rules, and regulations, and refuge staff will monitor and assess the activities of all filmmakers, photographers, and audio recorders.

JUSTIFICATION

Allowing commercial filming, still photography or audio recording is an economic use that must contribute to the achievement of the refuge purposes, mission of the National Wildlife Refuge System, or the mission of the U.S. Fish and Wildlife Service. Providing opportunities for commercial filming, still photography, or audio recording that meets the above requirements should result in an increased public awareness of the refuge's ecological importance as well as advancing the public's knowledge and support for the National Wildlife Refuge System and the U.S. Fish and Wildlife Service. The stipulations outlined above and conditions imposed in the special use permits issued to commercial filmmakers, still photographers, and audio recorders will ensure that these wildlife-dependent activities occur without adverse effects on refuge resources or refuge visitors.

Mandatory 15-year reevaluation date: 2024**DESCRIPTION OF USE: COMMERCIALY GUIDED OR OUTFITTED STOCK ANIMAL SERVICES FOR GAME RETRIEVAL AND ACCESS ACROSS THE REFUGE INTO THE CENTENNIAL MOUNTAINS**

Use of stock animals by the public to retrieve game and access the Centennial Mountains is currently authorized on the refuge (see “Recreational Hunting—Compatibility Determination” which was evaluated separately). There is no authorized use of hunting guides on the refuge.

Commercially guided and/or outfitted stock animal services can be divided into two categories. The first is the use of stock animals (with or without the services of the stock owner) to retrieve big game taken on the refuge or adjacent lands. This service is typically provided to moose hunters on the refuge as it is usually logistically difficult to remove moose carcasses on foot due to the terrain and size of the animal. In addition, this service has been typically provided to hunters that take an elk off-refuge in the upper elevations of the Centennial Mountains. Many times, the only feasible access to this animal is to cross refuge property with the outfitted stock animals. Approximately, ten to twenty pack trips are made annually to retrieve animals.

The second category of use is to provide access to hunters, campers, and environmental education students that are being guided and/or taught by the sole outfitting and guiding service (known as Centennial Outfitters) authorized to operate in the Centennial Mountains (under State of Montana and Bureau of Land Management permits). Access to the Centennial Mountains across public land is extremely limited—especially on the east end of the mountain range where the refuge exists. Access into the Centennial Mountains by this outfitter is restricted to two access points across the refuge (Odell Creek Trail and Shambow Trail). Approximately sixty-five to seventy-five trips are made each year over a period of 55 to 65 days. The majority of the trips occur in September, October, and November. Trips vary in the number of stock animals that are used from one (just a rider on a horse) up to twenty-three animals (various number of riders and pack animals). The largest number of animals occurs during the summer months (typically July) when Centennial Outfitters are offering day trips for wildlife observation and environmental education and interpretation programs.

Centennial Outfitters is the sole commercial operation licensed to operate in the Centennial Mountains. Access onto and across the refuge has been conducted utilizing a special use permit in past years. As of 2005, Centennial Outfitters reports all

trips made across the refuge as well as the number of riders and animals used as a condition of their special use permit.

The use of commercially provided stock animals contributes to fulfillment of refuge purposes and to the National Wildlife Refuge System mission by facilitating priority public uses (hunting, wildlife observation, interpretation and environmental education) and management of healthy wildlife populations through controlled hunting.

AVAILABILITY OF RESOURCES

Adequate refuge personnel and base operational funds are available to manage this commercial activity at existing levels. Administrative staff time primarily involves issuing one special use permit a year. This burden could be reduced by extending the period of use of this one permit. Fieldwork associated with administering this program primarily involves monitoring the permittee’s compliance with permit terms and assessing trail conditions. Total staff time for administering this permit is approximately 5 days per year.

ANTICIPATED IMPACTS OF THE USE

Wildlife disturbance from horseback riding and stock animals is not well-documented. However, some studies suggest that many wildlife species are habituated to livestock and that horseback wildlife observers can approach wildlife at closer distances than by other forms of travel (Bennett and Zuelke 1999, Williams and Conway-Durver 1998).

Horseback riding and the use of stock animals has both a direct and indirect effect on habitat. Trampling causes mortality of plant and animal species. Indirect effects result when soil is compacted and plants cannot reestablish (Summer 1980). Grazing can reduce vegetation. Nonnative plant species can be spread by stock animals through feces and seeds dropped that were caught in a stock animal’s hair. In addition, stock animal manure, although not harmful to human health, can cause conflicts with other trail users since it can be odorous, unaesthetic, and a nuisance.

While there can be user group conflicts and some limited safety issues resulting from hikers and commercial use of stock animals using the same trail, these are expected to be minimal given the current level of use.

In general the impacts to wildlife, plant species, and other visitors to the refuge are expected to be minimal given the current level of use by one outfitter using stock animals to access the Centennial Mountains or retrieve game animals from the refuge.

DETERMINATION

Commercially guided or outfitted stock animal services for game retrieval and access across the refuge into the Centennial Mountains is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- All commercial use of stock animals requires a special use permit. Special use permits will identify conditions that protect the refuge's values, purposes, resources, and public health and safety, as well as prevent unreasonable disruption of the public's use and enjoyment of the refuge. Such conditions may be, but are not limited to, specifying trail conditions when access will not be allowed, establishing limitations on the group size and number of trips allowed annually, recommendations for preventing the spread of nonnative vegetation, and identifying routes of access into the refuge. These conditions will be identified to prevent excessive disturbance to wildlife, damage to habitat or refuge infrastructure, or conflicts with other visitor services or management activities.
- The commercial use of stock animals must demonstrate a means to extend public appreciation and understanding of wildlife or natural habitats, or both; or enhance education, appreciation and understanding of the National Wildlife Refuge System; or facilitate outreach, education, and visitor services goals of the refuge. Failure to demonstrate any of these criteria will result in denial of a special use permit.
- Commercial stock animals may not be corralled, tethered, or hitched along trails on the refuge.

JUSTIFICATION

Commercially guided and outfitted stock animal services is a form of traditional activity that Congress intended to preserve with the enactment of the Wilderness Act, which is an important act guiding the management of the refuge. Access into the Centennial Mountains will be much more restricted if these services were not allowed. The requirements placed on recreation guides ensure that these commercial operations are safe and high-quality operations. These requirements are by the Bureau of Land Management through its selection process, by the refuge through the terms of a special use permit, and by the state of Montana through regulations placed on guides and outfitters. These services are a valuable benefit to a segment of the American public that is not physically able to, not comfortable with, or for other reasons chooses not to participate in unguided trips into the Centennial

Mountains. Access across the refuge by commercially guided or outfitted stock animals is essential to getting these types of Americans into Red Rock Lakes Wilderness. In addition, due to the difficulty of pedestrian travel in the area where moose hunting is allowed on the refuge, many moose hunters will not be able to retrieve their animals if this service were not provided.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: RESEARCH

Red Rock Lakes National Wildlife Refuge receives approximately one to three requests per year to conduct scientific research on the refuge. Priority will be given to studies that contribute to the enhancement, protection, preservation, and management of the refuge's native plant, fish, and wildlife populations and their habitats. Research applicants must submit a proposal that outlines the (1) objectives of the study; (2) justification for the study; (3) detailed study methodology and schedule; and (4) potential impacts on refuge wildlife and habitat, including disturbance (short and long-term), injury, or mortality. This includes (1) a description of measures the researcher will take to reduce disturbances or impacts; (2) personnel required and their qualifications and experience; (3) status of necessary permits (scientific collecting permits, endangered species permits); (4) costs to refuge and refuge staff time requested, if any; and (5) anticipated progress reports and end products (such as reports or publications). Refuge staff or others, as appropriate, will review research proposals and issues special use permits if approved.

Evaluation criteria will include, but not be limited to, the following:

- Research that will contribute to specific refuge management issues will be given higher priority over other requests.
- Research that will conflict with other ongoing research, monitoring, or management programs will not be approved.
- Research projects that can be conducted off-refuge are less likely to be approved.
- Research that causes undue disturbance or is intrusive will likely not be approved. The degree and type of disturbance will be carefully weighed when evaluating a research request.
- Research evaluation will determine if any effort has been made to minimize disturbance through study design, including adjusting location, timing, number of permittees, study methods, and number of study sites.
- If staffing or logistics make it impossible for the refuge to monitor researcher activity in a sensitive area, this may be reason to deny the request, depending on the specific circumstances.

- The length of the project will be considered and agreed upon before approval. Projects will be reviewed annually.

The refuge currently has an active land acquisition program. If newly acquired property includes areas of research interest, the same special use permit process and evaluation criteria described above will be followed.

AVAILABILITY OF RESOURCES

Adequate funding and staffing currently exist to manage a limited amount of research at Red Rock Lakes National Wildlife Refuge. As always, discretionary use of staff time will be weighed through a cost-benefit analysis. It is anticipated that approximately \$6,000 per year will be required to administer and manage research activities described above. Administration will include, but not be limited to, evaluation of applications, management of permits, and oversight of research projects.

ANTICIPATED IMPACTS OF USE

Some degree of disturbance is expected with all research activities since most researchers will be entering areas that are seasonally closed or conducting research in remote areas of the refuge that have limited visitation by the general public, and some research requires collection of samples or handling of wildlife. However, minimal impact on refuge wildlife and habitats is expected with research studies because special use permits will include conditions to ensure that impact to wildlife and habitats are kept to a minimum.

DETERMINATION

Research use is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- Extremely sensitive wildlife habitat areas and wildlife species will be provided sufficient protection from disturbance by limiting proposed research activities in these areas. All refuge rules and regulations must be followed unless otherwise exempted by refuge management.
- Refuge staff will use the criteria for evaluating a research proposal, as outlined above under "Description of Use," when determining whether to approve a proposed study on the refuge. If proposed research methods are evaluated and determined to have potential impacts on refuge resources (habitat or wildlife), it must be demonstrated that the research is necessary for refuge resource conservation management. Measures to

minimize potential impacts will need to be developed and included as part of the study design. In addition, these measures will be listed as conditions on the special use permit.

- Refuge staff will monitor research activities for compliance with conditions of the special use permit. At any time, refuge staff may accompany the researchers to determine potential impacts. Staff may determine that previously approved research and special use permits be terminated due to observed impacts. The refuge manager will also have the ability to cancel a special use permit if the researcher is out of compliance, or to ensure wildlife and habitat protection.

JUSTIFICATION

The program as described is determined to be compatible. Potential impacts of research activities on refuge resources will be minimized because sufficient restrictions will be included as part of the study design, and research activities will be monitored by the refuge staff. Research projects will contribute to the enhancement, protection, preservation, and management of the refuge's wildlife populations and their habitats.

Mandatory 15-year reevaluation date: 2024

DESCRIPTION OF USE: GRAZING

The refuge currently uses livestock grazing as a tool to manage a variety of upland, riparian, and seasonal wetland habitats. Livestock grazing has been a preferred management tool because the effect on habitat is controllable and measurable. Livestock grazing has been used in a variety of ways, including high intensity–short duration, rest rotation, and complete rest. Between 1994 and 2006 grazing rates ranged from 0.31–0.85 animal unit months (AUM) per acre, with an average of 3,790 AUM used annually. Actual rates per subunit varied substantially depending on the site, with some grazing unit rates being as low as 0.02 AUM per subunit and others as high as 2.17 AUM per acre. The refuge currently has twenty-three subunits where grazing is being used as a management tool. Maintenance of the fences is a constant effort due to weather, water, animal, and human impacts.

The comprehensive conservation plan proposes to continue using prescribed grazing in order to manage habitats. The comprehensive conservation plan will establish goals and objectives for specific habitat types (such as riparian, wet meadow, and shrub-steppe) where prescribed grazing may be used. In addition, target wildlife species (such as northern pintail and Brewer's sparrow) and their habitat requirements have been identified. This has resulted in development of objectives that will guide management to meet target wildlife species habitat

needs. The refuge will improve upon the vegetation and wildlife monitoring and research program in order to assess habitat and wildlife population responses to the prescribed grazing management program. Different grazing rates and management strategies will be investigated in order to determine the best methods for the refuge to meet the identified habitat goals and objectives of the comprehensive conservation plan.

AVAILABILITY OF RESOURCES

Current refuge staff and funding resources are limited for the purposes of monitoring habitats and implementing research needs to understand the impacts of grazing on refuge habitats. A minimum of one full-time seasonal biological technician will greatly enhance the refuge's ability to assess the outcomes of grazing. However, over the past 4 years, refuge staff have been able to use students from universities and colleges to lay the ground work for an improved monitoring program. In addition, the refuge recently completed a detailed vegetation inventory using the U.S. National Vegetation Classification Standards. Data were collected during the summers of 2005–2007. Field surveys were digitized, and a database for geographic information systems was generated. These data will greatly benefit the refuge in designing research and monitoring protocol for assessing the prescribed grazing management program.

ANTICIPATED IMPACTS OF USE

The prescribed grazing management program is intended to be used to meet habitat and species-specific goals and objectives identified in the comprehensive conservation plan. This management is intended to maintain and enhance habitat conditions for the benefit of a wide variety of fish and wildlife that use the refuge. Minimal negative impacts are expected through the use of this tool. Some trampling of areas may occur around watering areas or mineral licks. If fences are not maintained, it may be difficult to meet habitat objectives. It is anticipated that grazing will be in a mosaic pattern with some areas more intensely grazed than others in certain years. Grazing, as well as fire, is known to increase the nutrient cycling of nitrogen and phosphorous (Burke et al. 2005, Hauer and Spencer 1998, McEachern et al. 2000). Therefore, management of upland habitats adjacent to natural lakes (such as Upper and Swan lakes) and marshes could result in elevated levels of these nutrients in the lakes. Elevated levels of phosphorous and nitrogen can lead to increases in algae and turbidity in shallow lakes, which may ultimately lead to

significant losses of submerged aquatic vegetation communities (see for example, Egertson et al. 2004). In addition, the presence of livestock will be disturbing to some wildlife species and some visitors. The benefits of this habitat management tool are felt to outweigh these negative impacts.

DETERMINATION

Grazing use is a compatible use at Red Rock Lakes National Wildlife Refuge.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY

- Maintain existing riparian fences and use temporary fencing, as needed, to protect riparian habitats from cattle.
- Carry out a vegetation monitoring program to assess if focal species habitat requirements are being met.
- Carry out a study to determine the influence of cattle grazing on the abundance and distribution of small mammals, as identified in the comprehensive conservation plan.
- Begin vegetation monitoring of shrub-steppe and grassland habitats to assure adequate coverage of sagebrush, native bunchgrasses, and forbs—as identified in the comprehensive conservation plan.
- Begin nutrient (such as phosphorus, nitrogen) monitoring in Lower Red Rock, Upper Red Rock, and Swan lakes to ensure that nutrient levels are not increased to a point that will result in algae and turbidity increases and decreases in submerged aquatic vegetation communities.
- Grazing will be monitored and restricted if necessary to minimize disturbance to nesting birds.

JUSTIFICATION

To maintain and enhance habitat for migratory birds and other wildlife, some habitat management needs to occur. Prescribed livestock grazing is one option that can be used to achieve desired habitat conditions. Prescribed grazing is a useful tool because it can be controlled, and results of the grazing can be monitored (for example, vegetation monitoring) so that adjustments to the program can be made in order to meet habitat goals and objectives.

Mandatory 15-year reevaluation date: 2024

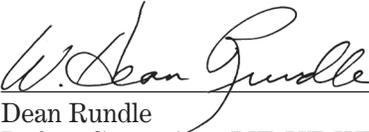
Submitted

 6/5/09
Bill West Date
Project Leader
Red Rock Lakes National Wildlife Refuge
MT

Approved

 6/10/09
Richard A. Coleman Date
Assistant Regional Director
National Wildlife Refuge System
CO

Review

 6/15/09
Dean Rundle Date
Refuge Supervisor (MT, UT, WY)
U.S. Fish and Wildlife Service, Region 6
CO

Appendix G

Species List

Below is a list of resident and migrant wildlife and plant species found at or adjacent to Red Rock Lakes National Wildlife Refuge.

This list includes all mammals, fish, and herpetofauna expected to occur on Red Rock Lakes National Wildlife Refuge based on refuge files, unpublished systematic survey data, and other relevant literature and data that pertains to southwest Montana. Some species, such as the bison, fisher, and big horn sheep, have been extirpated from the refuge. Bird species

listed in this appendix are based on the Red Rock Lakes National Wildlife Refuge Bird List, as well as additional information from refuge files. Plant species listed in this appendix are based upon plant collections made on or near the refuge (Dorn 1969, Culver 1994, Paullin 1971), refuge files, and the recent vegetation mapping of the refuge (Newlon 2007).

Taxonomic order follows the Integrated Taxonomic Information System (<http://www.its.gov>) and the "Check-list of North American Birds" ((Anon.) 2007).

CLASS AMPHIBIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Caudata	Blotched tiger salamander	<i>Ambystoma mavortium melanostictum</i>
Anura	Western toad	<i>Bufo boreas</i>
Anura	Columbia spotted frog	<i>Rana luteiventris</i>
Anura	Boreal chorus frog	<i>Pseudacris maculate</i>

CLASS REPTILIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Squamata	Western terrestrial garter snake	<i>Thamnophis elegans</i>

CLASS AVES

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Anseriformes	Snow goose	<i>Chen caerulescens</i>
Anseriformes	Ross's goose	<i>Chen rossii</i> *
Anseriformes	Greater white-fronted goose	<i>Anser albifrons</i> *
Anseriformes	Canada goose	<i>Branta canadensis</i>
Anseriformes	Trumpeter swan	<i>Cygnus buccinator</i>
Anseriformes	Tundra swan	<i>Cygnus columbianus</i>
Anseriformes	Mute swan	<i>Cygnus olor</i> **
Anseriformes	Black swan	<i>Cygnus atratus</i> **
Anseriformes	Wood duck	<i>Aix sponsa</i>
Anseriformes	Gadwall	<i>Anas strepera</i>
Anseriformes	American wigeon	<i>Anas americana</i>
Anseriformes	Mallard	<i>Anas platyrhynchos</i>
Anseriformes	Blue-winged teal	<i>Anas discors</i>
Anseriformes	Cinnamon teal	<i>Anas cyanoptera</i>
Anseriformes	Northern shoveler	<i>Anas clypeata</i>
Anseriformes	Northern pintail	<i>Anas acuta</i>
Anseriformes	Green-winged teal	<i>Anas crecca</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Anseriformes	Canvasback	<i>Aythya valisineria</i>
Anseriformes	Redhead	<i>Aythya Americana</i>
Anseriformes	Ring-necked duck	<i>Aythya collaris</i>
Anseriformes	Lesser scaup	<i>Aythya affinis</i>
Anseriformes	Greater scaup	<i>Aythya marila*</i>
Anseriformes	Bufflehead	<i>Bucephala albeola</i>
Anseriformes	Common goldeneye	<i>Bucephala clangula</i>
Anseriformes	Barrow's goldeneye	<i>Bucephala islandica</i>
Anseriformes	Hooded merganser	<i>Lophodytes cucullatus</i>
Anseriformes	Common merganser	<i>Mergus merganser</i>
Anseriformes	Red-breasted merganser	<i>Mergus serrator</i>
Anseriformes	Ruddy duck	<i>Oxyura jamaicensis</i>
Anseriformes	Surf scoter	<i>Melanitta perspicillata*</i>
Anseriformes	White-winged scoter	<i>Melanitta fusca*</i>
Anseriformes	Long-tailed duck	<i>Clangula hyemalis*</i>
Anseriformes	Harlequin duck	<i>Histrionicus histrionicus*</i>
Galliformes	Ruffed grouse	<i>Bonasa umbellus</i>
Galliformes	Dusky grouse	<i>Dendragapus obscurus</i>
Galliformes	Greater sage-grouse	<i>Centrocercus urophasianus</i>
Galliformes	Columbia sharp-tailed grouse	<i>Tympanuchus phasianellus columbianus</i>
Galliformes	Gray partridge	<i>Perdix perdix+</i>
Galliformes	Ring-necked pheasant	<i>Phasianus colchicus**</i>
Gaviiformes	Common loon	<i>Gavia immer</i>
Gaviiformes	Arctic loon	<i>Gavia arctica*</i>
Podicipediformes	Pied-billed grebe	<i>Podilymbus podiceps</i>
Podicipediformes	Horned grebe	<i>Podiceps auritus</i>
Podicipediformes	Red-necked grebe	<i>Podiceps grisegena</i>
Podicipediformes	Eared grebe	<i>Podiceps nigricollis</i>
Podicipediformes	Western grebe	<i>Aechmophorus occidentalis</i>
Podicipediformes	Clark's grebe	<i>Aechmophorus clarkii</i>
Pelicaniformes	American white pelican	<i>Pelecanus erythrocephalus</i>
Pelicaniformes	Double-crested cormorant	<i>Phalacrocorax auritus</i>
Ciconiiformes	American bittern	<i>Botaurus lentiginosus*</i>
Ciconiiformes	Great blue heron	<i>Ardea Herodias</i>
Ciconiiformes	Great egret	<i>Ardea alba*</i>
Ciconiiformes	Snowy egret	<i>Egretta caerulea*</i>
Ciconiiformes	Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Ciconiiformes	White-faced ibis	<i>Plegadis chihi</i>
Ciconiiformes	Turkey vulture	<i>Cathartes aura*</i>
Falconiformes	Osprey	<i>Pandion haliaetus</i>
Falconiformes	Bald eagle	<i>Haliaeetus leucocephalus</i>
Falconiformes	Northern harrier	<i>Circus cyaneus</i>
Falconiformes	Sharp-shinned hawk	<i>Accipiter striatus</i>
Falconiformes	Cooper's hawk	<i>Accipiter cooperii</i>
Falconiformes	Northern goshawk	<i>Accipiter gentilis</i>
Falconiformes	Swainson's hawk	<i>Buteo swainsoni</i>
Falconiformes	Red-tailed hawk	<i>Buteo jamaicensis</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Falconiformes	Ferruginous hawk	<i>Buteo regalis</i>
Falconiformes	Rough-legged hawk	<i>Buteo lagopus</i>
Falconiformes	Golden eagle	<i>Aquila chrysaetos</i>
Falconiformes	American kestrel	<i>Falco sparverius</i>
Falconiformes	Merlin	<i>Falco columbarius</i>
Falconiformes	Peregrine falcon	<i>Falco peregrinus</i>
Falconiformes	Prairie falcon	<i>Falco mexicanus</i>
Falconiformes	Gyr falcon	<i>Falco rusticolus</i> *
Gruiformes	Virginia rail	<i>Rallus limicola</i>
Gruiformes	Yellow rail	<i>Coturnicops noveboracensis</i> *
Gruiformes	Sora	<i>Porzana carolina</i>
Gruiformes	American coot	<i>Fulica americana</i>
Gruiformes	Sandhill crane	<i>Grus canadensis</i>
Gruiformes	Whooping crane	<i>Grus americana</i> *
Charadriiformes	Killdeer	<i>Charadrius vociferous</i>
Charadriiformes	Semipalmated plover	<i>Charadrius semipalmatus</i>
Charadriiformes	Mountain plover	<i>Charadrius montanus</i> *
Charadriiformes	Snowy plover	<i>Charadrius alexandrius</i> *
Charadriiformes	Black-bellied plover	<i>Pluvialis squatarola</i>
Charadriiformes	Black-necked stilt	<i>Himantopus mexicanus</i>
Charadriiformes	American avocet	<i>Recurvirostra americana</i>
Charadriiformes	Greater yellowlegs	<i>Tringa melanoleuca</i>
Charadriiformes	Lesser yellowlegs	<i>Tringa flavipes</i>
Charadriiformes	Solitary sandpiper	<i>Tringa solitaria</i>
Charadriiformes	Willet	<i>Catoptrophorus semipalmatus</i>
Charadriiformes	Spotted sandpiper	<i>Actitis macularia</i>
Charadriiformes	Upland sandpiper	<i>Bartamia longicauda</i> *
Charadriiformes	Long-billed curlew	<i>Numenius americanus</i>
Charadriiformes	Marbled godwit	<i>Limosa fedoa</i>
Charadriiformes	Long-billed dowitcher	<i>Limnodromus scolopaceus</i>
Charadriiformes	Wilson's snipe	<i>Gallinago delicata</i>
Charadriiformes	American woodcock	<i>Scolopax minor</i> *
Charadriiformes	Wilson's phalarope	<i>Phalaropus tricolor</i>
Charadriiformes	Red-necked phalarope	<i>Phalaropus lobatus</i> *
Charadriiformes	Parasitic jaeger	<i>Stercorarius parasiticus</i> *
Charadriiformes	Sanderling	<i>Calidris alba</i> *
Charadriiformes	Semipalmated sandpiper	<i>Calidris pusilla</i>
Charadriiformes	Western sandpiper	<i>Calidris mauri</i>
Charadriiformes	Least sandpiper	<i>Calidris minutilla</i>
Charadriiformes	White-rumped sandpiper	<i>Calidris fuscicollis</i>
Charadriiformes	Pectoral sandpiper	<i>Calidris melanotos</i> *
Charadriiformes	Dunlin	<i>Calidris alpina</i> *
Charadriiformes	Baird's sandpiper	<i>Calidris bairdii</i>
Charadriiformes	Franklin's gull	<i>Larus pipixcan</i>
Charadriiformes	Ring-billed gull	<i>Larus delawarensis</i>
Charadriiformes	California gull	<i>Larus californicus</i>
Charadriiformes	Herring gull	<i>Larus argentatus</i> *

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Charadriiformes	Bonaparte's gull	<i>Larus philadelphia*</i>
Charadriiformes	Forster's tern	<i>Sterna forsteri</i>
Charadriiformes	Black tern	<i>Sterna niger</i>
Charadriiformes	Caspian tern	<i>Sterna caspia*</i>
Charadriiformes	Common tern	<i>Sterna hirundo*</i>
Columbiformes	Mourning dove	<i>Zenaida macroura</i>
Columbiformes	Band-tailed pigeon	<i>Patagioenas fasciata*</i>
Columbiformes	Rock pigeon	<i>Columba livia*</i>
Cuculiformes	Black-billed cuckoo	<i>Coccyzus erythrophthalmus*</i>
Cuculiformes	Yellow-billed cuckoo	<i>Coccyzus americanus*</i>
Strigiformes	Great horned owl	<i>Bubo virginianus</i>
Strigiformes	Burrowing owl	<i>Athene cunicularia</i>
Strigiformes	Long-eared owl	<i>Asio otus</i>
Strigiformes	Short-eared owl	<i>Asio flammeus</i>
Strigiformes	Northern saw-whet owl	<i>Aegolius acadicus</i>
Strigiformes	Northern pygmy-owl	<i>Glaucidium gnoma</i>
Strigiformes	Western screech-owl	<i>Megascops kennicottii*</i>
Strigiformes	Great gray owl	<i>Strix nebulosa</i>
Caprimulgiformes	Common nighthawk	<i>Chordeiles minor</i>
Apodiformes	White-throated swift	<i>Aeronautes saxatalis*</i>
Apodiformes	Broad-tailed hummingbird	<i>Selasphorus platycercus</i>
Apodiformes	Rufous hummingbird	<i>Selasphorus rufus</i>
Apodiformes	Calliope hummingbird	<i>Stellula calliope</i>
Apodiformes	Black-chinned hummingbird	<i>Archilochus alexandri</i>
Coraciiformes	Belted kingfisher	<i>Ceryle alcyon</i>
Piciformes	Lewis' woodpecker	<i>Melanerpes lewis</i>
Piciformes	Red-headed woodpecker	<i>Melanerpes erythrocephalus*</i>
Piciformes	Downy woodpecker	<i>Picoides pubescens</i>
Piciformes	Hairy woodpecker	<i>Picoides villosus</i>
Piciformes	Black-backed woodpecker	<i>Picoides arcticus</i>
Piciformes	American three-toed woodpecker	<i>Picoides dorsalis</i>
Piciformes	Pileated woodpecker	<i>Dryocopus pileatus*</i>
Piciformes	Northern flicker	<i>Colaptes auratus</i>
Piciformes	Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>
Piciformes	Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Passeriformes	Western kingbird	<i>Tyrannus verticalis</i>
Passeriformes	Eastern kingbird	<i>Tyrannus forficatus</i>
Passeriformes	Say's phoebe	<i>Saynoris saya</i>
Passeriformes	Willow flycatcher	<i>Empidonax traillii</i>
Passeriformes	Dusky flycatcher	<i>Empidonax oberholseri</i>
Passeriformes	Hammond's flycatcher	<i>Empidonax hammondi</i>
Passeriformes	Cordilleran flycatcher	<i>Empidonax occidentalis</i>
Passeriformes	Least flycatcher	<i>Empidonax minimus*</i>
Passeriformes	Western wood-peewee	<i>Contopus sordidulus</i>
Passeriformes	Olive-sided flycatcher	<i>Contopus cooperi</i>
Passeriformes	Horned lark	<i>Eremophila alpestris</i>
Passeriformes	Tree swallow	<i>Tachycineta bicolor</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	Violet-green swallow	<i>Tachycineta thalassina</i> *
Passeriformes	Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i> *
Passeriformes	Bank swallow	<i>Riparia riparia</i>
Passeriformes	Cliff swallow	<i>Petrochelidon pyrrhonota</i>
Passeriformes	Barn swallow	<i>Hirundo rustica</i>
Passeriformes	Steller's jay	<i>Cyanocitta stelleri</i>
Passeriformes	Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Passeriformes	Gray jay	<i>Perisoreus Canadensis</i>
Passeriformes	Blue jay	<i>Cyanocitta cristata</i> *
Passeriformes	Black-billed magpie	<i>Pica hudsonia</i>
Passeriformes	American crow	<i>Corvus brachyrhynchos</i>
Passeriformes	Common raven	<i>Corvus corax</i>
Passeriformes	Clark's nutcracker	<i>Nucifraga columbiana</i>
Passeriformes	Black-capped chickadee	<i>Poecile atricappila</i>
Passeriformes	Mountain chickadee	<i>Poecile gambeli</i>
Passeriformes	American dipper	<i>Cinclus mexicanus</i>
Passeriformes	Red-breasted nuthatch	<i>Sitta canadensis</i>
Passeriformes	White-breasted nuthatch	<i>Sitta carolinensis</i>
Passeriformes	Pygmy nuthatch	<i>Sitta pygmaea</i> *
Passeriformes	Brown creeper	<i>Certhia americana</i>
Passeriformes	House wren	<i>Troglodytes aedon</i>
Passeriformes	Winter wren	<i>Troglodytes troglodytes</i> *
Passeriformes	Rock wren	<i>Salpinctes obsoletus</i>
Passeriformes	Canyon wren	<i>Catherpes mexicanus</i>
Passeriformes	Marsh wren	<i>Cistothorus palustris</i>
Passeriformes	Gray catbird	<i>Dumetella carolinensis</i>
Passeriformes	Northern mockingbird	<i>Mimus polyglottos</i> *
Passeriformes	Sage thrasher	<i>Oreoscoptes montanus</i>
Passeriformes	American robin	<i>Turdus migratorius</i>
Passeriformes	Townsend's solitaire	<i>Myadestes townsendi</i>
Passeriformes	Swainson's thrush	<i>Catharus ustulatus</i>
Passeriformes	Hermit thrush	<i>Catharus guttatus</i>
Passeriformes	Veery	<i>Catharus fuscescens</i>
Passeriformes	Mountain bluebird	<i>Sialia currucoides</i>
Passeriformes	Western bluebird	<i>Sialia mexicana</i>
Passeriformes	Golden-crowned kinglet	<i>Regulus satrapa</i>
Passeriformes	Ruby-crowned kinglet	<i>Regulus calendula</i>
Passeriformes	American pipit	<i>Anthus rubescens</i> *
Passeriformes	Sprague's pipit	<i>Anthus spragueii</i>
Passeriformes	Bohemian waxwing	<i>Bombycilla garrulous</i>
Passeriformes	Cedar waxwing	<i>Bombycilla cedrorum</i>
Passeriformes	Loggerhead shrike	<i>Lanius ludovicianus</i>
Passeriformes	Northern shrike	<i>Lanius excubitor</i>
Passeriformes	European starling	<i>Sturnus vulgaris</i> +
Passeriformes	Warbling vireo	<i>Vireo gilvus</i>
Passeriformes	Cassin's vireo	<i>Vireo cassinii</i>
Passeriformes	Red-eyed vireo	<i>Vireo olivaceus</i> *

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	Tennessee warbler	<i>Vermivora peregrina</i> *
Passeriformes	Orange-crowned warbler	<i>Vermivora celata</i> *
Passeriformes	Yellow warbler	<i>Dendroica petechia</i>
Passeriformes	Yellow-rumped warbler	<i>Dendroica coronata</i>
Passeriformes	Townsend's warbler	<i>Dendroica townsendi</i> *
Passeriformes	Northern waterthrush	<i>Seiurus noveboracensis</i> *
Passeriformes	Common yellowthroat	<i>Geothlypis trichas</i>
Passeriformes	MacGillivray's warbler	<i>Oporornis tolmiei</i>
Passeriformes	Wilson's warbler	<i>Wilsonia pusilla</i>
Passeriformes	Yellow-breasted chat	<i>Icteria virens</i> *
Passeriformes	American redstart	<i>Setophaga ruticilla</i>
Passeriformes	House sparrow	<i>Passer domesticus</i> ⁺
Passeriformes	Bobolink	<i>Dolichonyx oryzivorus</i> *
Passeriformes	Western meadowlark	<i>Sturnella neglecta</i>
Passeriformes	Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Passeriformes	Red-winged blackbird	<i>Agelaius phoeniceus</i>
Passeriformes	Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Passeriformes	Common grackle	<i>Quiscalus quiscula</i> *
Passeriformes	Brown-headed cowbird	<i>Molothrus ater</i>
Passeriformes	Bullock's oriole	<i>Icterus bullockii</i> *
Passeriformes	Western tanager	<i>Piranga ludoviciana</i>
Passeriformes	Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
Passeriformes	Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i> *
Passeriformes	Evening grosbeak	<i>Coccothraustes vespertinus</i>
Passeriformes	Lazuli bunting	<i>Passerina amoena</i>
Passeriformes	Cassin's finch	<i>Carpodacus cassinii</i>
Passeriformes	House finch	<i>Carpodacus mexicanus</i> ⁺
Passeriformes	Pine grosbeak	<i>Pinicola enucleator</i>
Passeriformes	Gray-crowned rosy finch	<i>Leucosticte tephrocotis</i>
Passeriformes	Black rosy finch	<i>Leucosticte atrata</i>
Passeriformes	White-winged crossbill	<i>Loxia leucoptera</i> *
Passeriformes	Common redpoll	<i>Carduelis flammea</i>
Passeriformes	Pine siskin	<i>Carduelis pinus</i>
Passeriformes	American goldfinch	<i>Carduelis tristis</i>
Passeriformes	Red crossbill	<i>Loxia curvirostra</i>
Passeriformes	Green-tailed towhee	<i>Pipilo chlorurus</i> *
Passeriformes	Spotted towhee	<i>Pipilo maculatus</i> *
Passeriformes	Savannah sparrow	<i>Passerculus sandwichensis</i>
Passeriformes	Lark bunting	<i>Calamospiza melanocorys</i>
Passeriformes	Vesper sparrow	<i>Poocetes gramineus</i>
Passeriformes	Lark sparrow	<i>Chondestes grammacus</i>
Passeriformes	Dark-eyed junco	<i>Junco hyemalis</i>
Passeriformes	American tree sparrow	<i>Spizella arborea</i>
Passeriformes	Chipping sparrow	<i>Spizella passerina</i>
Passeriformes	Brewer's sparrow	<i>Spizella breweri</i>
Passeriformes	Clay-colored sparrow	<i>Spizella pallida</i> *
Passeriformes	White-crowned sparrow	<i>Zonotrichia leucophrys</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Passeriformes	White-throated sparrow	<i>Zonotrichia albicollis</i> *
Passeriformes	Harris' sparrow	<i>Zonotrichia querula</i> *
Passeriformes	Fox sparrow	<i>Passerelia iliaca</i>
Passeriformes	Song sparrow	<i>Melospiza melodia</i>
Passeriformes	Lincoln sparrow	<i>Melospiza lincolni</i>
Passeriformes	Grasshopper sparrow	<i>Ammodramus savannarum</i>
Passeriformes	Sage sparrow	<i>Amphispiza belli</i> *
Passeriformes	McCown's longspur	<i>Calcarius mccownii</i> *
Passeriformes	Lapland longspur	<i>Calcarius lapponicus</i> *
Passeriformes	Chestnut-collared longspur	<i>Calcarius ornatus</i> *
Passeriformes	Snow bunting	<i>Plectrophenax nivalis</i>

CLASS MAMMALIA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Insectivora	Masked shrew	<i>Sorex cinereus</i>
Insectivora	Water shrew	<i>Sorex palustris</i>
Chiroptera	Little brown bat	<i>Myotis lucifugus</i>
Chiroptera	Small-footed bat	<i>Myotis leibii</i>
Chiroptera	Hoary bat	<i>Lasiurus cinereus</i>
Chiroptera	Silver-haired bat	<i>Lasionycteris noctivagans</i>
Carnivora	Black bear	<i>Ursus americanus</i>
Carnivora	Grizzly bear	<i>Ursus arctos</i> *
Carnivora	Ermine	<i>Mustela erminea</i>
Carnivora	Long-tailed weasel	<i>Mustela frenata</i>
Carnivora	Mink	<i>Mustela vison</i>
Carnivora	Marten	<i>Martes americana</i>
Carnivora	Fisher	<i>Martes pennanti</i> *
Carnivora	Wolverine	<i>Gulo gulo</i> *
Carnivora	River otter	<i>Lontra canadensis</i>
Carnivora	Badger	<i>Taxidea taxus</i>
Carnivora	Striped skunk	<i>Mephitis mephitis</i>
Carnivora	Raccoon	<i>Procyon lotor</i>
Carnivora	Red fox	<i>Vulpes vulpes</i>
Carnivora	Coyote	<i>Canis latrans</i>
Carnivora	Gray wolf	<i>Canis lupus</i>
Carnivora	Bobcat	<i>Lynx rufus</i>
Carnivora	Canada lynx	<i>Lynx canadensis</i> *
Carnivora	Mountain lion	<i>Puma concolor</i>
Artiodactyla	Moose	<i>Alces alces</i>
Artiodactyla	Pronghorn	<i>Antilocapra americana</i>
Artiodactyla	Bison	<i>Bison bison</i> *
Artiodactyla	Elk	<i>Cervus elaphus</i>
Artiodactyla	Mule deer	<i>Odocoileus hemionus</i>
Artiodactyla	White-tailed deer	<i>Odocoileus virginianus</i>
Artiodactyla	Bighorn sheep	<i>Ovis Canadensis</i> *
Lagomorpha	White-tailed jackrabbit	<i>Lepus townsendii</i>
Lagomorpha	Black-tailed jackrabbit	<i>Lepus californicus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Lagomorpha	Snowshoe hare	<i>Lepus americanus</i>
Lagomorpha	Pygmy rabbit	<i>Brachylagus idahoensis</i>
Lagomorpha	Pika	<i>Ochotona princeps</i>
Rodentia	Wyoming ground squirrel	<i>Spermophilus elegans</i>
Rodentia	Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>
Rodentia	Northern flying squirrel	<i>Glaucomys sabrihus</i>
Rodentia	Red squirrel	<i>Tamiasciurus hudsonicus</i>
Rodentia	Least chipmunk	<i>Tamias minimus</i>
Rodentia	Yellow-pine chipmunk	<i>Tamias amoenus</i>
Rodentia	Yellow-bellied marmot	<i>Marmota flaviventris</i>
Rodentia	Bushy-tailed woodrat	<i>Neotoma cinerea</i>
Rodentia	Porcupine	<i>Erethizon dorsatum</i>
Rodentia	Northern pocket gopher	<i>Thomomys talpoides</i>
Rodentia	Muskrat	<i>Ondatra zibethicus</i>
Rodentia	Beaver	<i>Castor canadensis</i>
Rodentia	Deer mouse	<i>Peromyscus maniculatus</i>
Rodentia	Western jumping mouse	<i>Zapus princeps</i>
Rodentia	Southern red-backed vole	<i>Clethrionomys gapperi</i>
Rodentia	Meadow vole	<i>Microtus pennsylvanicus</i>
Rodentia	Montane vole	<i>Microtus montanus</i>
Rodentia	Long-tailed vole	<i>Microtus longicaudus</i>

CLASS OSTEICHTHYES

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cypriniformes	White sucker	<i>Catostomus commersonii</i> ⁺
Cypriniformes	Longnose sucker	<i>Catostomus catostomus</i>
Cypriniformes	Mountain sucker	<i>Catostomus platyrhynchus</i>
Cypriniformes	Longnose dace	<i>Rhinichthys cataractae</i>
Gadiformes	Burbot	<i>Lota lota</i>
Salmoniformes	Arctic grayling	<i>Thymallus arcticus</i>
Salmoniformes	Mountain whitefish	<i>Prosopium williamsoni</i>
Salmoniformes	Westslope cutthroat trout	<i>Oncorhynchus clarkii lewisi</i>
Salmoniformes	Yellowstone cutthroat trout	<i>Oncorhynchus clarkii bowvieri</i> ⁺
Salmoniformes	Rainbow trout	<i>Oncorhynchus mykiss</i> ⁺
Salmoniformes	Brook trout	<i>Salvelinus fontinalis</i> ⁺
Scorpaeniformes	Mottled sculpin	<i>Cottus bairdii</i>

PLANTS**CLASS PINOPIPSIDA**

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Pinales	Subalpine fir	<i>Abies lasiocarpa</i>
Pinales	Engelmann spruce	<i>Picea engelmannii</i>
Pinales	Whitebark pine	<i>Pinus albicaulis</i>
Pinales	Lodgepole pine	<i>Pinus contorta</i>
Pinales	Limber pine	<i>Pinus flexilis</i>
Pinales	Douglas-fir	<i>Pseudotsuga menziesii</i>
Pinales	Rocky Mountain juniper	<i>Juniperus scopulorum</i>
Pinales	Common juniper	<i>Juniperus communis</i>
Pinales	Creeping juniper	<i>Juniperus horizontalis</i>

CLASS MAGNOLIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Salicales	Balsam poplar	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>
Salicales	Quaking aspen	<i>Populus tremuloides</i>
Salicales	Bebb willow	<i>Salix bebbiana</i>
Salicales	Booth's willow	<i>Salix boothii</i>
Salicales	Sageleaf willow	<i>Salix candida</i>
Salicales	Drummond's willow	<i>Salix drummondiana</i>
Salicales	Geyer willow	<i>Salix geyeriana</i>
Salicales	Grayleaf willow	<i>Salix glauca</i>
Salicales	Pacific willow	<i>Salix lucida</i> ssp. <i>lasiandra</i>
Salicales	Yellow willow	<i>Salix lutea</i>
Salicales	Blueberry willow	<i>Salix myrtilifolia</i>
Salicales	Diamondleaf willow	<i>Salix planifolia</i>
Salicales	False mountain willow	<i>Salix pseudomonticola</i>
Salicales	Scouler's willow	<i>Salix scouleriana</i>
Salicales	Wolf's willow	<i>Salix wolfii</i>
Sapindales	Rocky Mountain maple	<i>Acer glabrum</i>
Asterales	Little sagebrush	<i>Artemisia arbuscula</i> ssp. <i>arbuscula</i>
Asterales	Alkali sagebrush	<i>Artemisia arbuscula</i> ssp. <i>longiloba</i>
Asterales	Silver sagebrush	<i>Artemisia cana</i> ssp. <i>viscidula</i>
Asterales	Prairie sagewort	<i>Artemisia frigida</i>
Asterales	Basin big sagebrush	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>
Asterales	Mountain big sagebrush	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>
Asterales	Threetip sagebrush	<i>Artemisia tripartita</i> ssp. <i>tripartita</i>
Asterales	Green rabbitbrush	<i>Chrysothamnus viscidiflorus</i>
Asterales	Whitestem goldenbush	<i>Ericameria discoidea</i>
Asterales	Rubber rabbitbrush	<i>Ericameria nauseosa</i>
Asterales	Dwarf goldenbush	<i>Ericameria nana</i>
Asterales	Singlehead goldenbush	<i>Ericameria suffruticosa</i>
Asterales	Spineless horsebrush	<i>Tetradymia canescens</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Common yarrow	<i>Achillea millefolium</i>
Asterales	Orange agoseris	<i>Agoseris aurantiaca</i>
Asterales	Pale agoseris	<i>Agoseris glauca</i>
Asterales	Western pearly everlasting	<i>Anaphalis margaritacea</i>
Asterales	Alpine pussytoes	<i>Antennaria alpina</i>
Asterales	Pearly pussytoes	<i>Antennaria anaphaloides</i>
Asterales	Flat-top pussytoes	<i>Antennaria corymbosa</i>
Asterales	Rush pussytoes	<i>Antennaria luzuloides</i>
Asterales	Littleleaf pussytoes	<i>Antennaria microphylla</i>
Asterales	Raceme pussytoes	<i>Antennaria racemosa</i>
Asterales	Rosy pussytoes	<i>Antennaria rosea</i>
Asterales	Chamisso arnica	<i>Arnica chamissonis</i>
Asterales	Heartleaf arnica	<i>Arnica cordifolia</i>
Asterales	Broadleaf arnica	<i>Arnica latifolia</i>
Asterales	Hairy arnica	<i>Arnica mollis</i>
Asterales	Twin arnica	<i>Arnica sororia</i>
Asterales	Biennial wormwood	<i>Artemisia biennis</i>
Asterales	Tarragon	<i>Artemisia dracuncululus</i>
Asterales	White sagebrush	<i>Artemisia ludoviciana</i>
Asterales	Arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>
Asterales	Nodding beggartick	<i>Bidens cernua</i>
Asterales	Musk thistle	<i>Carduus nutans</i> ⁺
Asterales	Spotted knapweed	<i>Centaurea stoebe</i> ⁺
Asterales	Douglas' dustymaiden	<i>Chaenactis douglasii</i>
Asterales	Canada thistle	<i>Cirsium arvense</i> ⁺
Asterales	Graygreen thistle	<i>Cirsium canovirens</i>
Asterales	Meadow thistle	<i>Cirsium scariosum</i>
Asterales	Wavyleaf thistle	<i>Cirsium undulatum</i>
Asterales	Bull thistle	<i>Cirsium vulgare</i> ⁺
Asterales	Tapertip hawksbeard	<i>Crepis acuminata</i>
Asterales	Fiddleleaf hawksbeard	<i>Crepis runcinata</i>
Asterales	Giant sumpweed	<i>Cyclachaena xanthifolia</i>
Asterales	Tufted fleabane	<i>Erigeron caespitosus</i>
Asterales	Cutleaf daisy	<i>Erigeron compositus</i>
Asterales	Longleaf fleabane	<i>Erigeron corymbosus</i>
Asterales	Streamside fleabane	<i>Erigeron glabellus</i>
Asterales	Quill fleabane	<i>Erigeron gracilis</i>
Asterales	Shortray fleabane	<i>Erigeron lonchophyllus</i>
Asterales	Buff fleabane	<i>Erigeron ochroleucus</i>
Asterales	Philadelphia fleabane	<i>Erigeron philadelphicus</i>
Asterales	Subalpine fleabane	<i>Erigeron peregrinus</i>
Asterales	Rydberg's fleabane	<i>Erigeron rydbergii</i>
Asterales	Aspen fleabane	<i>Erigeron speciosus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Tweedy's fleabane	<i>Erigeron tweedyi</i>
Asterales	Common woolly sunflower	<i>Eriophyllum lanatum</i>
Asterales	Elegant aster	<i>Eucephalus elegans</i>
Asterales	Engelmann's aster	<i>Eucephalus engelmannii</i>
Asterales	Western showy aster	<i>Eurybia conspicua</i>
Asterales	Thickstem aster	<i>Eurybia integrifolia</i>
Asterales	Common gaillardia	<i>Gaillardia aristata</i>
Asterales	Western marsh cudweed	<i>Gnaphalium palustre</i>
Asterales	Curlycup gumweed	<i>Grindelia squarrosa</i>
Asterales	Oneflower helianthella	<i>Helianthella uniflora</i>
Asterales	Common sunflower	<i>Helianthus annuus</i>
Asterales	Nuttall's sunflower	<i>Helianthus nuttallii</i>
Asterales	Showy goldeneye	<i>Heliomeris multiflora</i>
Asterales	White hawkweed	<i>Hieracium albiflorum</i>
Asterales	Houndstongue hawkweed	<i>Hieracium cynoglossoides</i>
Asterales	Slender hawkweed	<i>Hieracium gracile</i>
Asterales	Fineleaf hymenopappus	<i>Hymenopappus filifolius</i>
Asterales	Owl's-claws	<i>Hymenoxys hoopesii</i>
Asterales	Lava aster	<i>Ionactis alpina</i>
Asterales	Tall blue lettuce	<i>Lactuca biennis</i>
Asterales	Blue lettuce	<i>Lactuca tatarica</i>
Asterales	Hoary tansyaster	<i>Machaeranthera canescens</i>
Asterales	Mountain tarweed	<i>Madia glomerata</i>
Asterales	Disc mayweed	<i>Matricaria discoidea</i>
Asterales	Nodding microseris	<i>Microseris nutans</i>
Asterales	Meadow prairie-dandelion	<i>Nothocalais nigrescens</i>
Asterales	Woolly groundsel	<i>Packera cana</i>
Asterales	Weak groundsel	<i>Packera debilis</i>
Asterales	Elegant groundsel	<i>Packera indecora</i>
Asterales	Balsam groundsel	<i>Packera paupercula</i>
Asterales	Falsegold groundsel	<i>Packera pseud aurea</i>
Asterales	Rocky Mountain groundsel	<i>Packera streptanthifolia</i>
Asterales	Hoary groundsel	<i>Packera wernerifolia</i>
Asterales	Arctic sweet coltsfoot	<i>Petasites frigidus</i>
Asterales	Many-stemmed goldenweed	<i>Pyrocoma integrifolia</i>
Asterales	Lanceleaf goldenweed	<i>Pyrocoma lanceolata</i>
Asterales	Plantain goldenweed	<i>Pyrocoma uniflora</i>
Asterales	Western coneflower	<i>Rudbeckia occidentalis</i>
Asterales	Thickleaf ragwort	<i>Senecio crassulus</i>
Asterales	Dwarf mountain ragwort	<i>Senecio fremontii</i>
Asterales	Tall ragwort	<i>Senecio hydrophiloides</i>
Asterales	Water ragwort	<i>Senecio hydrophilus</i>
Asterales	Lambstongue ragwort	<i>Senecio integerrimus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Asterales	Small blacktip ragwort	<i>Senecio lugens</i>
Asterales	Tall ragwort	<i>Senecio serra</i>
Asterales	Ballhead ragwort	<i>Senecio sphaerocephalus</i>
Asterales	Arrowleaf ragwort	<i>Senecio triangularis</i>
Asterales	Canada goldenrod	<i>Solidago canadensis</i>
Asterales	Missouri goldenrod	<i>Solidago missouriensis</i>
Asterales	Manyray goldenrod	<i>Solidago multiradiata</i>
Asterales	Gray goldenrod	<i>Solidago nemoralis</i>
Asterales	Dwarf goldenrod	<i>Solidago simplex</i>
Asterales	Moist sowthistle	<i>Sonchus arvensis</i> ⁺
Asterales	Stemless mock goldenweed	<i>Stenotus acaulis</i>
Asterales	Woolly mock goldenweed	<i>Stenotus lanuginosus</i>
Asterales	Narrowleaf wirelettuce	<i>Stephanomeria minor</i>
Asterales	Western meadow aster	<i>Symphotrichum campestre</i>
Asterales	Eaton's aster	<i>Symphotrichum eatonii</i>
Asterales	White prairie aster	<i>Symphotrichum falcatum</i>
Asterales	Alpine leafybract aster	<i>Symphotrichum foliaceum</i>
Asterales	White panicle aster	<i>Symphotrichum lanceolatum</i>
Asterales	Western mountain aster	<i>Symphotrichum spathulatum</i>
Asterales	Common tansy	<i>Tanacetum vulgare</i> ⁺
Asterales	Rock dandelion	<i>Taraxacum laevigatum</i> ⁺
Asterales	Common dandelion	<i>Taraxacum officinale</i> ⁺
Asterales	Graylocks four-nerve daisy	<i>Tetranneuris grandiflora</i>
Asterales	Wyoming Townsend daisy	<i>Townsendia alpigena</i>
Asterales	Cushion Townsend daisy	<i>Townsendia condensata</i>
Asterales	Parry's Townsend daisy	<i>Townsendia parryi</i>
Asterales	Yellow salsify	<i>Tragopogon dubius</i> ⁺
Asterales	Jack-to-bed-at-noon	<i>Tragopogon lamottei</i> ⁺
Asterales	Mule-ears	<i>Wyethia amplexicaulis</i>
Asterales	Sunflower mule-ears	<i>Wyethia helianthoides</i>
Fagales	Bog birch	<i>Betula pumila</i>
Caryophyllales	Brittle pricklypear	<i>Opuntia fragilis</i>
Caryophyllales	Greasewood	<i>Sarcobatus vermiculatus</i>
Dipsacales	Twinberry honeysuckle	<i>Lonicera involucrata</i>
Dipsacales	Utah honeysuckle	<i>Lonicera utahensis</i>
Dipsacales	Red elderberry	<i>Sambucus racemosa</i>
Dipsacales	Mountain snowberry	<i>Symphoricarpos oreophilus</i>
Dipsacales	Squashberry	<i>Viburnum edule</i>
Dipsacales	Twinflower	<i>Linnaea borealis</i>
Dipsacales	Tobacco root	<i>Valeriana edulis</i>
Dipsacales	Western valerian	<i>Valeriana occidentalis</i>
Cornales	Redosier dogwood	<i>Cornus sericea</i>
Cornales	Bunchberry dogwood	<i>Cornus canadensis</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Rhamnales	Russet buffaloberry	<i>Shepherdia canadensis</i>
Rhamnales	Alderleaf buckthorn	<i>Rhamnus alnifolia</i>
Ericales	Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
Ericales	Thinleaf huckleberry	<i>Vaccinium membranaceum</i>
Ericales	Grouse whortleberry	<i>Vaccinium scoparium</i>
Ericales	Pipsissewa	<i>Chimaphila umbellata</i>
Ericales	Sidebells wintergreen	<i>Orthilia secunda</i>
Ericales	Liverleaf wintergreen	<i>Pyrola asarifolia</i>
Ericales	Single delight	<i>Moneses uniflora</i>
Ericales	Greenflowered wintergreen	<i>Pyrola chlorantha</i>
Fabales	Siberian peashrub	<i>Caragana arborescens</i> ⁺
Fabales	Purple milkvetch	<i>Astragalus agrestis</i>
Fabales	Alpine milkvetch	<i>Astragalus alpinus</i>
Fabales	American milkvetch	<i>Astragalus americanus</i>
Fabales	Silverleaf milkvetch	<i>Astragalus argophyllus</i>
Fabales	Canadian milkvetch	<i>Astragalus canadensis</i>
Fabales	Browse milkvetch	<i>Astragalus cibarius</i>
Fabales	Drummond's milkvetch	<i>Astragalus drummondii</i>
Fabales	Elegant milkvetch	<i>Astragalus eucosmus</i>
Fabales	Flexile milkvetch	<i>Astragalus flexuosus</i>
Fabales	Bent milkvetch	<i>Astragalus inflexus</i>
Fabales	Spiny milkvetch	<i>Astragalus kentrophyta</i>
Fabales	Prairie milkvetch	<i>Astragalus laxmannii</i>
Fabales	Freckled milkvetch	<i>Astragalus lentiginosus</i>
Fabales	Park milkvetch	<i>Astragalus leptaleus</i>
Fabales	Timber milkvetch	<i>Astragalus miser</i>
Fabales	Woollypod milkvetch	<i>Astragalus purshii</i>
Fabales	Railhead milkvetch	<i>Astragalus terminalis</i>
Fabales	Bentflower milkvetch	<i>Astragalus vexilliflexus</i>
Fabales	Utah sweetvetch	<i>Hedysarum boreale</i>
Fabales	White sweetvetch	<i>Hedysarum sulphurescens</i>
Fabales	Silvery lupine	<i>Lupinus argenteus</i>
Fabales	Velvet lupine	<i>Lupinus leucophyllus</i>
Fabales	Bigleaf lupine	<i>Lupinus polyphyllus</i>
Fabales	Silky lupine	<i>Lupinus sericeus</i>
Fabales	Yellow sweetclover	<i>Melilotus officinalis</i> ⁺
Fabales	Nodding locoweed	<i>Oxytropis deflexa</i>
Fabales	Haresfoot locoweed	<i>Oxytropis lagopus</i>
Fabales	White locoweed	<i>Oxytropis sericea</i>
Fabales	Slimflower scurfpea	<i>Psoralidium tenuiflorum</i>
Fabales	Alsike clover	<i>Trifolium hybridum</i> ⁺
Fabales	Longstalk clover	<i>Trifolium longipes</i>
Fabales	Red clover	<i>Trifolium pratense</i> ⁺

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Fabales	White clover	<i>Trifolium repens</i> ⁺
Fabales	American vetch	<i>Vicia americana</i>
Rosales	Wax currant	<i>Ribes cereum</i>
Rosales	Northern black currant	<i>Ribes hudsonianum</i>
Rosales	Whitestem gooseberry	<i>Ribes inerme</i>
Rosales	Gooseberry currant	<i>Ribes montigenum</i>
Rosales	Inland gooseberry	<i>Ribes oxycanthoides</i>
Rosales	Sticky currant	<i>Ribes viscosissimum</i>
Rosales	Shrubby cinquefoil	<i>Dasiphora fruticosa</i>
Rosales	Mat rockspirea	<i>Petrophyton caespitosum</i>
Rosales	Chokecherry	<i>Prunus virginiana</i>
Rosales	Woods' rose	<i>Rosa woodsii</i>
Rosales	American red raspberry	<i>Rubus idaeus</i>
Rosales	Thimbleberry	<i>Rubus parviflorus</i>
Rosales	Greene's mountain ash	<i>Sorbus scopulina</i>
Rosales	White spirea	<i>Spiraea betulifolia</i>
Rosales	Ledge stonecrop	<i>Rhodiola integrifolia</i>
Rosales	Redpod stonecrop	<i>Rhodiola rhodantha</i>
Rosales	Leiberg stonecrop	<i>Sedum leibergii</i>
Rosales	Spearleaf stonecrop	<i>Sedum lanceolatum</i>
Rosales	Silverweed cinquefoil	<i>Argentina anserina</i>
Rosales	Virginia strawberry	<i>Fragaria virginiana</i>
Rosales	Largeleaf avens	<i>Geum macrophyllum</i>
Rosales	Old man's whiskers	<i>Geum triflorum</i>
Rosales	Gordon's ivesia	<i>Ivesia gordonii</i>
Rosales	Varileaf cinquefoil	<i>Potentilla diversifolia</i>
Rosales	Sticky cinquefoil	<i>Potentilla glandulosa</i>
Rosales	Slender cinquefoil	<i>Potentilla gracilis</i>
Rosales	Sheep cinquefoil	<i>Potentilla ovina</i>
Rosales	Platte River cinquefoil	<i>Potentilla plattensis</i>
Rosales	Roundleaf alumroot	<i>Heuchera cylindrica</i>
Rosales	Smallflower woodland-star	<i>Lithophragma parviflorum</i>
Rosales	Smallflower miterwort	<i>Mitella stauropetala</i>
Rosales	Fringed grass of Parnassus	<i>Parnassia fimbriata</i>
Rosales	Smallflower grass of Parnassus	<i>Parnassia palustris</i>
Rosales	Yellowdot saxifrage	<i>Saxifraga bronchialis</i>
Rosales	Brook saxifrage	<i>Saxifraga odontoloma</i>
Rosales	Diamondleaf saxifrage	<i>Saxifraga rhomboidea</i>
Solanales	Granite prickly phlox	<i>Linanthus pungens</i>
Solanales	Dwarf hesperochiron	<i>Hesperochiron pumilus</i>
Solanales	Ballhead waterleaf	<i>Hydrophyllum capitatum</i>
Solanales	Basin nemophila	<i>Nemophila breviflora</i>
Solanales	Franklin's phacelia	<i>Phacelia franklinii</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Solanales	Silverleaf phacelia	<i>Phacelia hastata</i>
Solanales	Silky phacelia	<i>Phacelia sericea</i>
Solanales	Tiny trumpet	<i>Collomia linearis</i>
Solanales	Spiny phlox	<i>Phlox hoodii</i>
Solanales	Kelsey's phlox	<i>Phlox kelseyi</i>
Solanales	Longleaf phlox	<i>Phlox longifolia</i>
Solanales	Western polemonium	<i>Polemonium occidentale</i>
Solanales	Jacob's-ladder	<i>Polemonium pulcherrimum</i>
Solanales	Sticky polemonium	<i>Polemonium viscosum</i>
Solanales	Black henbane	<i>Hyoscyamus niger</i> ⁺
Scrophulariales	Bush penstemon	<i>Penstemon fruticosus</i>
Scrophulariales	Flat-top broomrape	<i>Orobanche corymbosa</i>
Scrophulariales	Clustered broomrape	<i>Orobanche fasciculata</i>
Scrophulariales	Louisiana broomrape	<i>Orobanche ludoviciana</i>
Scrophulariales	Wyoming besseya	<i>Besseya wyomingensis</i>
Scrophulariales	Yellow Indian paintbrush	<i>Castilleja flava</i>
Scrophulariales	Giant red Indian paintbrush	<i>Castilleja miniata</i>
Scrophulariales	Sulphur Indian paintbrush	<i>Castilleja sulphurea</i>
Scrophulariales	Maiden blue eyed Mary	<i>Collinsia parviflora</i>
Scrophulariales	Water mudwort	<i>Limosella aquatica</i>
Scrophulariales	Seep monkeyflower	<i>Mimulus guttatus</i>
Scrophulariales	Yellow owl's-clover	<i>Orthocarpus luteus</i>
Scrophulariales	Field locoweed	<i>Oxytropis campestris</i>
Scrophulariales	Elephanthead lousewort	<i>Pedicularis groenlandica</i>
Scrophulariales	Parry's lousewort	<i>Pedicularis parryi</i>
Scrophulariales	Sickletop lousewort	<i>Pedicularis racemosa</i>
Scrophulariales	Sulphur penstemon	<i>Penstemon attenuatus</i>
Scrophulariales	Cordroot beardtongue	<i>Penstemon montanus</i>
Scrophulariales	Matroot penstemon	<i>Penstemon radicosus</i>
Scrophulariales	Rydberg's penstemon	<i>Penstemon rydbergii</i>
Scrophulariales	American speedwell	<i>Veronica americana</i>
Scrophulariales	American alpine speedwell	<i>Veronica wormskjoldii</i>
Scrophulariales	Common bladderwort	<i>Utricularia macrorhiza</i>
Alismatales	Arumleaf arrowhead	<i>Sagittaria cuneata</i>
Apiales	Lyall's angelica	<i>Angelica arguta</i>
Apiales	Small-leaf angelica	<i>Angelica pinnata</i>
Apiales	American thorum wax	<i>Bupleurum americanum</i>
Apiales	Western water hemlock	<i>Cicuta douglasii</i>
Apiales	Plains springparsley	<i>Cymopterus acaulis</i>
Apiales	Snowline springparsley	<i>Cymopterus nivalis</i>
Apiales	Common cowparsnip	<i>Heracleum maximum</i>
Apiales	Fernleaf licorice-root	<i>Ligusticum filicinum</i>
Apiales	Wyeth biscuitroot	<i>Lomatium ambiguum</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Apiales	Cous biscuitroot	<i>Lomatium cous</i>
Apiales	Desert biscuitroot	<i>Lomatium foeniculaceum</i>
Apiales	Bigseed biscuitroot	<i>Lomatium macrocarpum</i>
Apiales	Nineleaf biscuitroot	<i>Lomatium triternatum</i>
Apiales	Leafy wildparsley	<i>Musineon divaricatum</i>
Apiales	Sweetcicely	<i>Osmorhiza berteroi</i>
Apiales	Bluntseed sweetroot	<i>Osmorhiza depauperata</i>
Apiales	Western sweetroot	<i>Osmorhiza occidentalis</i>
Apiales	Gardner's yampah	<i>Perideridia gairdneri</i>
Apiales	Henderson's wavewing	<i>Pteryxia hendersonii</i>
Apiales	Hemlock waterparsnip	<i>Sium suave</i>
Apiales	Meadow zizia	<i>Zizia aptera</i>
Lamiales	Sanddune cryptantha	<i>Cryptantha fendleri</i>
Lamiales	Roundspike cryptantha	<i>Cryptantha humilis</i>
Lamiales	Torrey's cryptantha	<i>Cryptantha torreyana</i>
Lamiales	Watson's cryptantha	<i>Cryptantha watsonii</i>
Lamiales	Gypsyflower	<i>Cynoglossum officinale</i>
Lamiales	Manyflower stickseed	<i>Hackelia floribunda</i>
Lamiales	Jessica sticktight	<i>Hackelia micrantha</i>
Lamiales	Spotted stickseed	<i>Hackelia patens</i>
Lamiales	Flatspine stickseed	<i>Lappula occidentalis</i>
Lamiales	Narrowleaf stoneseed	<i>Lithospermum incisum</i>
Lamiales	Western stoneseed	<i>Lithospermum ruderale</i>
Lamiales	Tall fringed bluebells	<i>Mertensia ciliata</i>
Lamiales	Oblongleaf bluebells	<i>Mertensia oblongifolia</i>
Lamiales	Tall bluebells	<i>Mertensia paniculata</i>
Lamiales	Asian forget-me-not	<i>Myosotis asiatica</i>
Lamiales	True forget-me-not	<i>Myosotis scorpioides</i>
Lamiales	Sleeping popcornflower	<i>Plagiobothrys scouleri</i>
Lamiales	Nettleleaf giant hyssop	<i>Agastache urticifolia</i>
Lamiales	Wild mint	<i>Mentha arvensis</i>
Lamiales	Common selfheal	<i>Prunella vulgaris</i>
Lamiales	Marsh skullcap	<i>Scutellaria galericulata</i>
Lamiales	Marsh hedgenettle	<i>Stachys palustris</i>
Capparales	Pale madwort	<i>Alyssum alyssoides</i> ⁺
Capparales	Desert madwort	<i>Alyssum desertorum</i>
Capparales	Spreadingpod rockcress	<i>Arabis xdivaricarpa</i>
Capparales	Hairy rockcress	<i>Arabis hirsuta</i>
Capparales	Collins' rockcress	<i>Arabis holboellii</i>
Capparales	Lemmon's rockcress	<i>Arabis lemmonii</i>
Capparales	Littleleaf rockcress	<i>Arabis microphylla</i>
Capparales	Nuttall's rockcress	<i>Arabis nuttallii</i>
Capparales	Sicklepod rockcress	<i>Arabis sparsiflora</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Capparales	American yellowrocket	<i>Barbarea orthoceras</i>
Capparales	Littlepod false flax	<i>Camelina microcarpa</i>
Capparales	Shepherd's purse	<i>Capsella bursa-pastoris</i> ⁺
Capparales	Brewer's bittercress	<i>Cardamine breweri</i>
Capparales	Crossflower	<i>Chorispota tenella</i>
Capparales	Mountain tansymustard	<i>Descurainia incana</i>
Capparales	Western tansymustard	<i>Descurainia pinnata</i>
Capparales	Herb sophia	<i>Descurainia sophia</i> ⁺
Capparales	Golden draba	<i>Draba aurea</i>
Capparales	Cushion draba	<i>Draba breweri</i>
Capparales	Snowbed draba	<i>Draba crassifolia</i>
Capparales	Lancepod draba	<i>Draba lonchocarpa</i>
Capparales	Woodland draba	<i>Draba nemorosa</i>
Capparales	Fewseed draba	<i>Draba oligosperma</i>
Capparales	Payson's draba	<i>Draba paysonii</i>
Capparales	Western wallflower	<i>Erysimum asperum</i>
Capparales	Wormseed wallflower	<i>Erysimum cheiranthoides</i> ⁺
Capparales	Shy wallflower	<i>Erysimum inconspicuum</i>
Capparales	Common pepperweed	<i>Lepidium densiflorum</i>
Capparales	Mountain pepperweed	<i>Lepidium montanum</i>
Capparales	Clasping pepperweed	<i>Lepidium perfoliatum</i> ⁺
Capparales	Virginia pepperweed	<i>Lepidium virginicum</i>
Capparales	Idaho bladderpod	<i>Lesquerella carinata</i>
Capparales	Onerow yellowcress	<i>Nasturtium microphyllum</i> ⁺
Capparales	Watercress	<i>Nasturtium officinale</i> ⁺
Capparales	Meadow pennycress	<i>Noccaea parviflora</i>
Capparales	Common twinpod	<i>Physaria didymocarpa</i>
Capparales	Curvepod yellowcress	<i>Rorippa curvisiliqua</i>
Capparales	Bog yellowcress	<i>Rorippa palustris</i>
Capparales	Small tumbleweed mustard	<i>Sisymbrium loeselii</i> ⁺
Capparales	Alpine smelowskia	<i>Smelowskia calycina</i>
Capparales	Northwestern thelypody	<i>Thelypodium paniculatum</i>
Capparales	Arrow thelypody	<i>Thelypodium sagittatum</i>
Capparales	Field pennycress	<i>Thlaspi arvense</i>
Campanulales	Bluebell bellflower	<i>Campanula rotundifolia</i>
Campanulales	Great Basin calicoflower	<i>Downingia laeta</i>
Caryophyllales	Slender mountain sandwort	<i>Arenaria capillaris</i>
Caryophyllales	Ballhead sandwort	<i>Arenaria congesta</i>
Caryophyllales	Field chickweed	<i>Cerastium arvense</i>
Caryophyllales	Bering chickweed	<i>Cerastium beeringianum</i>
Caryophyllales	Big chickweed	<i>Cerastium fontanum</i>
Caryophyllales	Nuttall's sandwort	<i>Minuartia nuttallii</i>
Caryophyllales	Twinflower sandwort	<i>Minuartia obtusiloba</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Caryophyllales	Beautiful sandwort	<i>Minuartia rubella</i>
Caryophyllales	Bluntleaf sandwort	<i>Moehringia lateriflora</i>
Caryophyllales	Tuber starwort	<i>Pseudostellaria jamesiana</i>
Caryophyllales	Western pearlwort	<i>Sagina decumbens</i>
Caryophyllales	Moss campion	<i>Silene acaulis</i>
Caryophyllales	Bladder campion	<i>Silene latifolia</i> ⁺
Caryophyllales	Menzies' campion	<i>Silene menziesii</i>
Caryophyllales	Nightflowering silene	<i>Silene noctiflora</i> ⁺
Caryophyllales	Parry's silene	<i>Silene parryi</i>
Caryophyllales	Northern starwort	<i>Stellaria calycantha</i>
Caryophyllales	Fleshy starwort	<i>Stellaria crassifolia</i>
Caryophyllales	Curled starwort	<i>Stellaria crispa</i>
Caryophyllales	Longleaf starwort	<i>Stellaria longifolia</i>
Caryophyllales	Longstalk starwort	<i>Stellaria longipes</i>
Caryophyllales	Rocky Mountain chickweed	<i>Stellaria obtusa</i>
Caryophyllales	Spear saltbrush	<i>Atriplex patula</i>
Caryophyllales	Wedgescale saltbush	<i>Atriplex truncata</i>
Caryophyllales	Lambsquarters	<i>Chenopodium album</i> ⁺
Caryophyllales	Blite goosefoot	<i>Chenopodium capitatum</i>
Caryophyllales	Oakleaf goosefoot	<i>Chenopodium glaucum</i> ⁺
Caryophyllales	Red goosefoot	<i>Chenopodium rubrum</i>
Caryophyllales	Nuttall's povertyweed	<i>Monolepis nuttalliana</i>
Caryophyllales	Red swampfire	<i>Salicornia rubra</i>
Caryophyllales	Lanceleaf springbeauty	<i>Claytonia lanceolata</i>
Caryophyllales	Bitter root	<i>Lewisia rediviva</i>
Caryophyllales	Water minerslettuce	<i>Montia chamissoi</i>
Papaverales	Scrambled eggs	<i>Corydalis aurea</i>
Gentianales	Elkweed	<i>Frasera speciosa</i>
Gentianales	Pleated gentian	<i>Gentiana affinis</i>
Gentianales	Moss gentian	<i>Gentiana fremontii</i>
Gentianales	Autumn dwarf gentian	<i>Gentianella amarella</i>
Gentianales	Oneflower fringed gentian	<i>Gentianopsis simplex</i>
Gentianales	Felwort	<i>Swertia perennis</i>
Geraniales	Richardson's geranium	<i>Geranium richardsonii</i>
Geraniales	Sticky geranium	<i>Geranium viscosissimum</i>
Malvales	Streambank wild hollyhock	<i>Iliamna rivularis</i>
Myrtales	Fireweed	<i>Chamerion angustifolium</i>
Myrtales	Tall annual willowherb	<i>Epilobium brachycarpum</i>
Myrtales	Fringed willowherb	<i>Epilobium ciliatum</i>
Myrtales	Glaucus willowherb	<i>Epilobium glaberrimum</i>
Myrtales	Hornemann's willowherb	<i>Epilobium hornemannii</i>
Myrtales	Marsh willowherb	<i>Epilobium palustre</i>
Myrtales	Spreading groundsmoke	<i>Gayophytum diffusum</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Myrtales	Dwarf groundsmoke	<i>Gayophytum humile</i>
Myrtales	Tufted evening-primrose	<i>Oenothera caespitosa</i>
Myrtales	Yellow evening-primrose	<i>Oenothera flava</i>
Myrtales	Pale evening-primrose	<i>Oenothera pallida</i>
Myrtales	Idaho pale evening-primrose	<i>Oenothera pallida</i> ssp. <i>pallida</i>
Plantaginales	Common plantain	<i>Plantago major</i>
Plantaginales	Tweedy's plantain	<i>Plantago tweedyi</i>
Polygonales	Matted buckwheat	<i>Eriogonum caespitosum</i>
Polygonales	Cushion buckwheat	<i>Eriogonum ovalifolium</i>
Polygonales	Sulphur-flower buckwheat	<i>Eriogonum umbellatum</i>
Polygonales	Alpine mountainsorrel	<i>Oxyria digyna</i>
Polygonales	American bistort	<i>Polygonum bistortoides</i>
Polygonales	Douglas' knotweed	<i>Polygonum douglasii</i>
Polygonales	Curlytop knotweed	<i>Polygonum lapathifolium</i>
Polygonales	Western dock	<i>Rumex aquaticus</i>
Polygonales	Alpine sheep sorrel	<i>Rumex paucifolius</i>
Polygonales	Water knotweed	<i>Polygonum amphibium</i>
Primulales	Pygmyflower rockjasmine	<i>Androsace septentrionalis</i>
Primulales	Darkthroat shootingstar	<i>Dodecatheon pulchellum</i>
Primulales	Silvery primrose	<i>Primula incana</i>
Ranunculales	Red baneberry	<i>Actaea rubra</i>
Ranunculales	Little Belt Mountain thimbleweed	<i>Anemone lithophila</i>
Ranunculales	Pacific anemone	<i>Anemone multifida</i>
Ranunculales	Yellow columbine	<i>Aquilegia flavescens</i>
Ranunculales	Western columbine	<i>Aquilegia formosa</i>
Ranunculales	Hairy clematis	<i>Clematis hirsutissima</i>
Ranunculales	Duncecap larkspur	<i>Delphinium occidentale</i>
Ranunculales	Little larkspur	<i>Delphinium bicolor</i>
Ranunculales	Twolobe larkspur	<i>Delphinium nuttallianum</i>
Ranunculales	Eastern pasqueflower	<i>Pulsatilla patens</i>
Ranunculales	Sharpleaf buttercup	<i>Ranunculus acriformis</i>
Ranunculales	Alkali buttercup	<i>Ranunculus cymbalaria</i>
Ranunculales	Sagebrush buttercup	<i>Ranunculus glaberrimus</i>
Ranunculales	Gmelin's buttercup	<i>Ranunculus gmelinii</i>
Ranunculales	High northern buttercup	<i>Ranunculus hyperboreus</i>
Ranunculales	Graceful buttercup	<i>Ranunculus inamoenus</i>
Ranunculales	Cursed buttercup	<i>Ranunculus sceleratus</i>
Ranunculales	Longbeak buttercup	<i>Ranunculus longirostris</i>
Ranunculales	Fendler's meadow-rue	<i>Thalictrum fendleri</i>
Ranunculales	Western meadow-rue	<i>Thalictrum occidentale</i>
Ranunculales	Veiny meadow-rue	<i>Thalictrum venulosum</i>
Ranunculales	Creeping barberry	<i>Mahonia repens</i>
Rubiales	Northern bedstraw	<i>Galium boreale</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Rubiales	Fragrant bedstraw	<i>Galium triflorum</i>
Santalales	Bastard toadflax	<i>Comandra umbellata</i>
Urticales	Stinging nettle	<i>Urtica dioica</i>
Violales	Hookedspur violet	<i>Viola adunca</i>
Violales	Northern bog violet	<i>Viola nephrophylla</i>
Violales	Goosefoot violet	<i>Viola purpurea</i>
Callitrichales	Northern water-starwort	<i>Callitriche hermaphroditica</i>
Callitrichales	Vernal water-starwort	<i>Callitriche palustris</i>
Callitrichales	Common mare's-tail	<i>Hippuris vulgaris</i>
Nymphaeales	Coon's tail	<i>Ceratophyllum demersum</i>
Haloragales	Shortspike watermilfoil	<i>Myriophyllum sibiricum</i>
Linales	Lewis flax	<i>Linum lewisii</i>

CLASS LILIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Najadales	Seaside arrowgrass	<i>Triglochin maritima</i>
Najadales	Nodding waternymph	<i>Najas flexilis</i>
Najadales	Leafy pondweed	<i>Potamogeton foliosus</i>
Najadales	Fries' pondweed	<i>Potamogeton friesii</i>
Najadales	Whitestem pondweed	<i>Potamogeton praelongus</i>
Najadales	Small pondweed	<i>Potamogeton pusillus</i>
Najadales	Richardson's pondweed	<i>Potamogeton richardsonii</i>
Najadales	Flatstem pondweed	<i>Potamogeton zosteriformis</i>
Najadales	Sago pondweed	<i>Stuckenia pectinata</i>
Najadales	Sheathed pondweed	<i>Stuckenia vaginata</i>
Najadales	Fineleaf pondweed	<i>Stuckenia filiformis</i>
Najadales	Horned pondweed	<i>Zannichellia palustris</i>
Liliales	Rocky Mountain iris	<i>Iris missouriensis</i>
Liliales	Narrowleaf blue-eyed grass	<i>Sisyrinchium angustifolium</i>
Liliales	Tapertip onion	<i>Allium acuminatum</i>
Liliales	Shortstyle onion	<i>Allium brevistylum</i>
Liliales	Nodding onion	<i>Allium cernuum</i>
Liliales	Geyer's onion	<i>Allium geyeri</i>
Liliales	Wild chives	<i>Allium schoenoprasum</i>
Liliales	Textile onion	<i>Allium textile</i>
Liliales	White mariposa lily	<i>Calochortus eurycarpus</i>
Liliales	Sego lily	<i>Calochortus nuttallii</i>
Liliales	Small camas	<i>Camassia quamash</i>
Liliales	Bride's bonnet	<i>Clintonia uniflora</i>
Liliales	Yellow avalanche-lily	<i>Erythronium grandiflorum</i>
Liliales	Spotted fritillary	<i>Fritillaria atropurpurea</i>
Liliales	Yellow fritillary	<i>Fritillaria pudica</i>
Liliales	Common alplily	<i>Lloydia serotina</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Liliales	Feathery false lily of the valley	<i>Maianthemum racemosum</i>
Liliales	Starry false lily of the valley	<i>Maianthemum stellatum</i>
Liliales	Roughfruit fairybells	<i>Prosartes trachycarpa</i>
Liliales	Claspleaf twistedstalk	<i>Streptopus amplexifolius</i>
Liliales	Meadow deathcamas	<i>Zigadenus venenosus</i>
Orchidales	Fairy slipper	<i>Calypso bulbosa</i>
Orchidales	Summer coralroot	<i>Corallorhiza maculata</i>
Orchidales	Pacific coralroot	<i>Corallorhiza mertensiana</i>
Orchidales	Western rattlesnake plantain	<i>Goodyera oblongifolia</i>
Orchidales	Northern twayblade	<i>Listera borealis</i>
Orchidales	Slender-spire orchid	<i>Piperia unalascensis</i>
Orchidales	Northern green orchid	<i>Platanthera aquilonis</i>
Orchidales	Slender bog orchid	<i>Platanthera stricta</i>
Orchidales	Hooded lady's tresses	<i>Spiranthes romanzoffiana</i>
Typhales	Broadleaf cattail	<i>Typha latifolia</i>
Typhales	Narrowleaf bur-reed	<i>Sparganium angustifolium</i>
Typhales	Broadfruit bur-reed	<i>Sparganium eurycarpum</i>
Typhales	Floating bur-reed	<i>Sparganium fluctuans</i>
Cyperales	Water sedge	<i>Carex aquatilis</i>
Cyperales	Slenderbeak sedge	<i>Carex athrostachya</i>
Cyperales	Golden sedge	<i>Carex aurea</i>
Cyperales	Lesser paniced sedge	<i>Carex diandra</i>
Cyperales	Softleaf sedge	<i>Carex disperma</i>
Cyperales	Douglas' sedge	<i>Carex douglasii</i>
Cyperales	Needleleaf sedge	<i>Carex duriuscula</i>
Cyperales	Threadleaf sedge	<i>Carex filifolia</i>
Cyperales	Geyer's sedge	<i>Carex geeyeri</i>
Cyperales	Cloud sedge	<i>Carex haydeniana</i>
Cyperales	Hood's sedge	<i>Carex hoodii</i>
Cyperales	Idaho sedge	<i>Carex idaho</i>
Cyperales	Inland sedge	<i>Carex interior</i>
Cyperales	Woollyfruit sedge	<i>Carex lasiocarpa</i>
Cyperales	Kellogg's sedge	<i>Carex lenticularis</i>
Cyperales	Smallwing sedge	<i>Carex microptera</i>
Cyperales	Manyrib sedge	<i>Carex multicostata</i>
Cyperales	Nebraska sedge	<i>Carex nebrascensis</i>
Cyperales	Chamisso sedge	<i>Carex pachystachya</i>
Cyperales	Dunhead sedge	<i>Carex phaeocephala</i>
Cyperales	Clustered field sedge	<i>Carex praegracilis</i>
Cyperales	Raynolds' sedge	<i>Carex raynoldsii</i>
Cyperales	Ross' sedge	<i>Carex rossii</i>
Cyperales	Northern singlespike sedge	<i>Carex scirpoidea</i>
Cyperales	Mountain sedge	<i>Carex scopulorum</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cyperales	Analogue sedge	<i>Carex simulata</i>
Cyperales	Northwest Territory sedge	<i>Carex utriculata</i>
Cyperales	Valley sedge	<i>Carex vallicola</i>
Cyperales	Whitescale sedge	<i>Carex xerantica</i>
Cyperales	Needle spikerush	<i>Eleocharis acicularis</i>
Cyperales	Pale spikerush	<i>Eleocharis macrostachya</i>
Cyperales	Common spikerush	<i>Eleocharis palustris</i>
Cyperales	Fewflower spikerush	<i>Eleocharis quinqueflora</i>
Cyperales	Tall cottongrass	<i>Eriophorum angustifolium</i>
Cyperales	Simple bog sedge	<i>Kobresia simpliciuscula</i>
Cyperales	Hardstem bulrush	<i>Schoenoplectus acutus</i>
Cyperales	Indian ricegrass	<i>Achnatherum hymenoides</i>
Cyperales	Columbia needlegrass	<i>Achnatherum nelsonii</i>
Cyperales	Western needlegrass	<i>Achnatherum occidentale</i>
Cyperales	Crested wheatgrass	<i>Agropyron cristatum</i> ⁺
Cyperales	Spike bentgrass	<i>Agrostis exarata</i>
Cyperales	Redtop	<i>Agrostis gigantea</i>
Cyperales	Seashore bentgrass	<i>Agrostis pallens</i>
Cyperales	Rough bentgrass	<i>Agrostis scabra</i>
Cyperales	Shortawn foxtail	<i>Alopecurus aequalis</i>
Cyperales	Boreal alopecurus	<i>Alopecurus alpinus</i>
Cyperales	Water foxtail	<i>Alopecurus geniculatus</i>
Cyperales	American sloughgrass	<i>Beckmannia syzigachne</i>
Cyperales	Fringed brome	<i>Bromus ciliatus</i> ⁺
Cyperales	Smooth brome	<i>Bromus inermis</i> ⁺
Cyperales	Mountain brome	<i>Bromus marginatus</i>
Cyperales	Cheatgrass	<i>Bromus tectorum</i> ⁺
Cyperales	Bluejoint	<i>Calamagrostis canadensis</i>
Cyperales	Plains reedgrass	<i>Calamagrostis montanensis</i>
Cyperales	Pinegrass	<i>Calamagrostis rubescens</i>
Cyperales	Northern reedgrass	<i>Calamagrostis stricta</i>
Cyperales	Water whorlgrass	<i>Catabrosa aquatica</i>
Cyperales	Drooping woodreed	<i>Cinna latifolia</i>
Cyperales	Orchardgrass	<i>Dactylis glomerata</i>
Cyperales	Timber oatgrass	<i>Danthonia intermedia</i>
Cyperales	Tufted hairgrass	<i>Deschampsia caespitosa</i>
Cyperales	Slender hairgrass	<i>Deschampsia elongata</i>
Cyperales	Saltgrass	<i>Distichlis spicata</i>
Cyperales	Baker's wheatgrass	<i>Elymus bakeri</i>
Cyperales	Blue wildrye	<i>Elymus glaucus</i>
Cyperales	Thickspike wheatgrass	<i>Elymus lanceolatus</i>
Cyperales	Quackgrass	<i>Elymus repens</i>
Cyperales	Slender wheatgrass	<i>Elymus trachycaulus</i>

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Cyperales	Alpine fescue	<i>Festuca brachyphylla</i>
Cyperales	Idaho fescue	<i>Festuca idahoensis</i>
Cyperales	Western fescue	<i>Festuca occidentalis</i>
Cyperales	Small floating mannagrass	<i>Glyceria borealis</i>
Cyperales	American mannagrass	<i>Glyceria grandis</i>
Cyperales	Fowl mannagrass	<i>Glyceria striata</i>
Cyperales	Needle-and-thread	<i>Hesperostipa comata</i>
Cyperales	Meadow barley	<i>Hordeum brachyantherum</i>
Cyperales	Foxtail barley	<i>Hordeum jubatum</i>
Cyperales	Prairie Junegrass	<i>Koeleria macrantha</i>
Cyperales	Basin wildrye	<i>Leymus cinereus</i>
Cyperales	Yellow wildrye	<i>Leymus flavescens</i>
Cyperales	Purple oniongrass	<i>Melica spectabilis</i>
Cyperales	Marsh muhly	<i>Muhlenbergia racemosa</i>
Cyperales	Mat muhly	<i>Muhlenbergia richardsonis</i>
Cyperales	Western wheatgrass	<i>Pascopyrum smithii</i>
Cyperales	Alpine timothy	<i>Phleum alpinum</i>
Cyperales	Common timothy	<i>Phleum pratense</i>
Cyperales	Canada bluegrass	<i>Poa compressa</i>
Cyperales	Cusick's bluegrass	<i>Poa cusickii</i>
Cyperales	Fowl bluegrass	<i>Poa palustris</i>
Cyperales	Kentucky bluegrass	<i>Poa pratensis</i>
Cyperales	Sandberg's bluegrass	<i>Poa secunda</i>
Cyperales	Rough bluegrass	<i>Poa trivialis</i>
Cyperales	Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>
Cyperales	Nuttall's alkaligrass	<i>Puccinellia nuttalliana</i>
Cyperales	Alkali cordgrass	<i>Spartina gracilis</i>
Cyperales	Spike trisetum	<i>Trisetum spicatum</i>
Juncales	Baltic rush	<i>Juncus arcticus</i> ssp. <i>littoralis</i>
Juncales	Toad rush	<i>Juncus bufonius</i>
Juncales	Colorado rush	<i>Juncus confusus</i>
Juncales	Drummond's rush	<i>Juncus drummondii</i>
Juncales	Common rush	<i>Juncus effusus</i>
Juncales	Swordleaf rush	<i>Juncus ensifolius</i>
Juncales	Hall's rush	<i>Juncus hallii</i>
Juncales	Longstyle rush	<i>Juncus longistylis</i>
Juncales	Parry's rush	<i>Juncus parryi</i>
Juncales	Rocky Mountain rush	<i>Juncus saximontanus</i>
Juncales	Smallflowered woodrush	<i>Luzula parviflora</i>
Hydrocharitales	Canadian waterweed	<i>Elodea canadensis</i>
Arales	Star duckweed	<i>Lemna trisulca</i>
Arales	Common duckweed	<i>Lemna minor</i>

CLASS FILICOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Polypodiales	Brittle bladderfern	<i>Cystopteris fragilis</i>
Polypodiales	Oregon cliff fern	<i>Woodsia oregana</i>
Polypodiales	Brewer's cliffbrake	<i>Pellaea breweri</i>

CLASS EQUISETOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Equisetales	Field horsetail	<i>Equisetum arvense</i>
Equisetales	Smooth horsetail	<i>Equisetum laevigatum</i>
Equisetales	Water horsetail	<i>Equisetum fluviatile</i>
Equisetales	Marsh horsetail	<i>Equisetum palustre</i>

CLASS LYCOPODIOPSIDA

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Isoetales	Quillwort	<i>Isoetes</i> spp.

CLASS CHAROPHYCEAE

<i>Order</i>	<i>Common Name</i>	<i>Scientific Name</i>
Charales	Common stonewort	<i>Chara vulgaris</i>

* *rare species*+ *nonnative species*

Appendix H

Fire Management Program

The U.S. Fish and Wildlife Service has administrative responsibility which includes fire management for Red Rock Lakes National Wildlife Refuge, which covers approximately 48,955 acres in southwestern Montana.

THE ROLE OF FIRE

Vegetation in the Rocky Mountains evolved under periodic disturbance and defoliation from fire, drought, floods, large herbivores, insect outbreaks, and disease. These periodic disturbances are what kept the ecosystem diverse and healthy, while maintaining significant biodiversity for thousands of years.

Historically, naturally occurring wildland fire played an important disturbance role in many ecosystems by stimulating regeneration, cycling nutrients, providing a diversity of habitats for plants and wildlife, and decreasing the impacts of insects and diseases.

When fire is excluded on a broad scale, the accumulation of living and dead fuels can contribute to degraded plant communities and wildlife habitats. These fuel accumulations often change fire system characteristics, and have created potential for uncharacteristically severe wildland fires.

Return of fire in most ecosystems is essential for healthy vegetation for wildlife habitat in grasslands, wetlands, and forests. When integrated back into an ecosystem, fire can help restore and maintain healthy systems and reduce the risk of wildland fires. To make fire's natural role in the environment easier, fire first must be integrated into land and resource management plans and activities on a broad scale.

Fire, when properly utilized, can

- reduce hazardous fuels buildup in both wildland–urban interface (WUI) and non-WUI areas;
- improve wildlife habitats by reducing the density of vegetation or changing plant species composition;
- sustain or increase biological diversity;
- improve woodlands and shrublands by reducing plant density;

- reduce susceptibility of plants to insect and disease outbreaks;
- improve the effectiveness of an integrated pest management program (such as for controlling smooth brome).

WILDLAND FIRE MANAGEMENT POLICY AND GUIDANCE

An update of the 1995 “Federal Fire Policy” was completed and approved in 2001 by the Secretaries of the Interior and Agriculture. The 2001 “Federal Wildland Fire Management Policy” directs federal agencies to achieve a balance between fire suppression to protect life, property, and resources, and fire use to regulate fuels and maintain healthy ecosystems. In addition, it directs agencies to use the appropriate management response for all wildland fire regardless of the ignition source. This policy provides eight guiding principles that are fundamental to the success of the fire management program:

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fires as an ecological process and natural change agent will be incorporated into the planning process.
- Fire management plans, programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities.
- Fire management programs and activities are economically viable, based on values to be protected, costs, and land and resource management objectives.
- Fire management plans (FMPs) and activities are based on the best available science.
- FMPs and activities incorporate public health and environmental quality consideration.
- Federal, state, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

The fire management considerations, guidance, and direction should be addressed in the land

use resource plans such as the comprehensive conservation plan (CCP). FMPs are step-down processes from the land use plans and habitat plans, with more detail on fire suppression, fire use, and fire management activities.

MANAGEMENT DIRECTION

Red Rock Lakes National Wildlife Refuge will suppress human-caused fires and wildfires that threaten life and property. The use of appropriate management response will be incorporated into the refuge's FMP to allow agency administrators the ability to choose from a full spectrum of fire suppression actions. Appropriate suppression actions, whether aggressive, high intensity, or low intensity actions, will be based on preplanned analysis and executed to minimize suppression costs, and resource losses consistent with land management objectives.

Wildland fire and prescribed fire, as well as manual and mechanical fuel treatments will be used in an ecosystem context to protect both federal and private property, and for habitat management purposes. Fuel reduction activities will be applied in collaboration with federal, state, private, and nongovernmental organization partners. In addition, fuel treatments will be prioritized based on the guidance for prioritization established in the goals and strategies outlined in the "U.S. Fish and Wildlife Services National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003–2010" and "Region 6 Refuges Regional Priorities FY07 to FY11." For WUI treatments, areas with community wildfire protection plans (CWPPs) and "Communities at Risk" will be the primary focus. The settlement of Lakeview, Montana, located adjacent to the refuge, was identified as a "Community at Risk" in the *Federal Register*: August 17, 2001 (Volume 66, Number 160). Lakeview is being incorporated into a CWPP.

All aspects of the fire management program will be conducted in a manner consistent with applicable laws, policies, and regulations. Red Rock Lakes National Wildlife Refuge will maintain an FMP to accomplish the fire management goals described below. Wildland fire, prescribed fire, and manual and mechanical fuel treatments will be applied in a scientific manner under selected weather and environmental conditions.

FIRE MANAGEMENT GOALS

The goals and strategies of the U.S. Fish and Wildlife Service National Wildlife Refuge System Wildland Fire Management Program Strategic Plan are consistent with the U.S. Department of the Interior and Service policies, National Fire Plan direction, the President's Healthy Forest Initiative, the 10-Year Comprehensive Strategy and Implementation Plan,

National Wildfire Coordinating Group Guidelines, initiatives of the Wildland Fire Leadership Council, and Interagency Standards for Fire and Aviation Operations.

The "Region 6 Refuges Regional Priorities FY07 through FY11" are consistent with the refuge's vision statement for region 6: "to maintain and improve the biological integrity of the region, ensure the ecological condition of the region's public and private lands are better understood, and endorse sustainable use of habitats that support native wildlife and people's livelihoods."

REFUGE FIRE MANAGEMENT GOALS

The goal of the refuge's fire management program is to work with our interagency partners to:

1. suppress human-caused fires and wildfires that threaten life and property.
2. reduce wildland fire risk to the community of Lakeview and other structures on public and private land through hazardous fuels reduction treatments.
3. use wildland and prescribed fire, manual, and mechanical treatment methods to achieve habitat goals and objectives identified in this CCP using scientific techniques and adaptive resource management to monitor results.
4. update the current (2002) "Fire Management Plan," incorporating fire management within an interagency fire management plan.

STRATEGIES

Strategies and tactics that consider public and firefighter safety as well as resource values at risk will be used. Wildland fire use and suppression, prescribed fire methods, manual and mechanical methods, timing, and monitoring are described in more detail within step-down FMPs.

All management actions will use wildland fire, prescribed fire, and manual or mechanical treatment methods to reduce hazardous fuels, restore and maintain desired habitat conditions, and control nonnative vegetation within the diverse ecosystem habitats. The fuels treatment program will be outlined in the FMP for the refuges. Site-specific prescribed fire plans will be developed following the "Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide" (2006) template.

Prescribed fire temporarily reduces air quality by reducing visibility and releasing components through combustion. The refuge will meet the Clean Air Act emission standards by adhering to the "Montana State Implementation Plan" requirements during all prescribed fire activities.

FIRE MANAGEMENT ORGANIZATION, CONTACTS, AND COOPERATION

Qualified fire management technical oversight for the refuge will be established by region 6, using the fire management district approach. Under this approach, fire management staff will be determined by established modeling systems based on the fire management workload of a group of refuges, and possibly that of interagency partners. The fire management workload consists of historical wildland fire activity, as well as historical and planned fuels treatments.

Depending on budgets, fire management staffing and support equipment may be located at the administrative station or at other refuges within the district and shared between all units. Fire management activities will be conducted in a coordinated and collaborative manner with federal and nonfederal partners.

A new FMP for Red Rock Lakes National Wildlife Refuge will be developed in collaboration with interagency partners.

Bibliography

- [Anon.] 2007. Check-list of North American birds. [Place of publication unknown]: American Ornithologists' Union. 7th ed., 48th supplement, 829 p.
- [Anon.] [No date]. Miscellaneous publication no. 54. Missoula, MT: Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana. [Pages unknown].
- Aitken, K.E.H.; Wiebe, K.L.; Martin, K. 2002. Nest-site reuse patterns for a cavity-nesting bird community in interior British Columbia. *The Auk* 119:391–402.
- Albanese J.A.; Hill C.L.; Davis L.B. 1995. Upper Pleistocene geology of the Merrell site (24BE1659), Centennial Valley, Southwest Montana. *Current research in the Pleistocene* 12:117–119.
- Allen, W. 1952. Letter discussing the conservation of grayling within the grayling sanctuary. Letter addressed to Kenneth MacDonald, Wildlife Refuge Supervisor, 11 June 1952. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Allen-Diaz, B.H. 1991. Water table and plant species relationships in Sierra Nevada meadows. *American Midland Naturalist* 126:30–43.
- Alisauskas, R.T.; Ankney, C.D. 1992. The cost of egg laying and its relationship to nutrient reserves in waterfowl. In: Batt, B.D.J.; Afton, A.D.; Anderson, M.G.; Ankney, C.D.; Johnson, D.H.; Kadlec, J.A.; Krapu, G.L., editors. *Ecology and management of breeding waterfowl*. Minneapolis: University of Minnesota Press. 30–61.
- Altman, B.; Sallabanks, R. 2000. Olive-sided flycatcher (*Contopus cooperi*). In: Poole, A.; Gill, F., editors. *The birds of North America* 502. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/502>> accessed May 2009.
- Ammon, E.M. 1995. Lincoln's sparrow (*Melospiza lincolni*). In: Poole, A.; Gill, F., editors. *The birds of North America* 191. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/191>> accessed February 2008.
- Anderson, S.H. 1995. Recreational disturbance and wildlife populations. In: Knight, R.L.; Gutzwiller, K.J., editors. *Wildlife and Recreationists: coexistence through management and research*. Washington DC: Island Press, 157–168.
- Anderson, M.; Bourgeron, P.; Bryer, M.T.; Crawford, R.; Engelking, L.; Faber-Langendoen, D.; Gallyoun, M.; Goodin, K.; Grossman, D.H.; Landaal, S.; Metzler, K.; Patterson, K.D.; Pyne, M.; Reid, M.; Sneddon, L.; Weakley, A.S. 1998. International classification of ecological communities: terrestrial vegetation of the United States. Volume 2. In: *The national vegetation classification system: list of types*. Arlington, VA: The Nature Conservancy. 126 p.
- Anderson, M.G.; Low, J.B. 1976. Use of sago pondweed by waterfowl on the Delta Marsh, Manitoba. *Journal of Wildlife Management* 40:233–242.
- Arcese, P.; Sogge, M.K.; Marr, A.B.; Patten, M.A. 2002. Song sparrow (*Melospiza melodia*). In: Poole, A.; Gill, F., editors. *The birds of North America* 704. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/704>> accessed May 2007.
- Austin, J.E.; Miller, M.R. 1995. Northern pintail (*Anas acuta*). In: Poole, A.; Gill, F., editors. *The birds of North America* 163. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/163>> accessed December 2007.
- Austin, J.E.; Henry, A.R.; Ball, I.J. 2007. Sandhill crane abundance and nesting ecology at Grays Lake, Idaho. *Journal of Wildlife Management* 71:1067–1079.
- Baker, W.L. 2006. Fire and restoration of sagebrush ecosystems. *Wildlife Society Bulletin* 34:177–185.
- Baldassarre, G.A.; Bolen, E.G. 2006. *Waterfowl ecology and management*. 2nd ed. Melbourne, FL: Krieger Publishing Company. 567 p.
- Banko, W.E. 1960. The trumpeter swan: its history, habits, and population in the United States. *North American Fauna* 63. Washington DC: Bureau of Sport Fisheries and Wildlife. 214 p.

- Bartelt, G.A. 1987. Effects of disturbance and hunting on the behavior of Canada goose family groups in east central Wisconsin. *Journal of Wildlife Management* 51:517–522.
- Bartos, D.L.; Campbell, R.B. 1998. Decline of quaking aspen in the Interior West—examples from Utah. *Rangelands* 20:17–24.
- Bauer, H.G.; Stark, H.; Frenzel, P. 1992. Disturbance factors and their effects on water birds wintering in the western parts of Lake Constance. *Der Ornithologische Beobachter* 89:81–91.
- Bayley, S.E.; Prather, C.M. 2003. Do wetland lakes exhibit alternative stable states? Submersed aquatic vegetation and chlorophyll in western boreal shallow lakes. *Limnology and Oceanography* 48:2335–2345.
- BBC Consulting. 2007. Red Rock Lakes National Wildlife Refuge socioeconomic impact analysis. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT. 1-11.
- Beaverhead County History Book Association. 1990. The history of Beaverhead County [1800–1920]. Volume 1. Dillon, MT: [Publisher unknown]. 696 p.
- Beed, W.E. 1957. Red Rock Lakes Aquatic Survey 1955 and 1956. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Bennett, K.A.; Zuelke, E. 1999. The effects of recreation on birds: a literature review. Smyrna, DE: Delaware Natural Heritage Program. [Pages unknown].
- Berger, J.; Stacey, P.B.; Bellis, L.; Johnson, M.P. 2001. A mammalian predator-prey imbalance: grizzly bear and wolf extinction affect avian Neotropical migrants. *Ecological Applications* 11:947–960.
- Beschta, R.L. 2003. Cottonwoods, elk, and wolves in the Lamar Valley of Yellowstone National Park. *Ecological Applications* 13:1295–1309.
- Bishop, R.A.; Andrews, R.D.; Bridges, R.J. 1979. Marsh management and its relationship to vegetation, waterfowl, and muskrats: Proceedings; 1979; Iowa. In: Proceedings of the Iowa Academy of Science 86:50–56.
- Brinson, M.M.; Lugo, A.E.; Brown, S. 1981. Primary productivity, decomposition and consumer activity in freshwater wetlands. *Annual Review of Ecological Systems* 12:123–161.
- Brown, K.; Hansen, A.J.; Keane, R.E.; Graumlich, L.J. 2006. Complex interactions shaping aspen dynamics in the Greater Yellowstone Ecosystem. *Landscape Ecology* 21:933–951.
- Bunting, S.C.; Robberecht, R.; Defosse, G.E. 1998. Length and timing of grazing on postburn productivity of two bunchgrasses in an Idaho experimental range. *International Journal of Wildland Fire* 8:15–20.
- Bunting, S.C.; Kilgore, B.M.; Bushey, C.L. 1987. Guidelines for prescribed burning sagebrush-grass rangelands in the northern Great Basin. USDA Forest Service General Technical Report INT-231. Ogden, UT: U.S. Department of Agriculture. 33 p.
- Burger, J.; Gochfeld, M.; 1994. Franklin's gull (*Larus pipixcan*). In: Poole, A.; Gill, F., editors. The birds of North America 116. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/116>> accessed August 2007.
- Burke, J.M.; Prepas, E.E.; Pinder, S. 2005. Runoff and phosphorus export patterns in large forested watersheds on the western Canadian Boreal Plain before and for 4 years after wildfire. *Journal of Environmental Engineering and Science* 4:319–325.
- Cary, K.L. 2005. Willow resilience on Yellowstone's northern elk winter range: a function of environmental gradients. [master's thesis]. Bozeman, MT: Montana State University. 155 p.
- Casey, D. 2000. Partners in flight draft bird conservation plan Montana. Version 1.0. Kalispell, MT: American Bird Conservancy, Montana Partners in Flight. 288 p.
- Castelli, R.M.; Chambers, J.C.; Tausch, R.J. 2000. Soil-plant relations along a soil-water gradient in Great Basin riparian meadows. *Wetlands* 20:251–266.
- Chadwick, H.W.; Dalke, P.D. 1965. Plant succession on sand dunes in Fremont County, Idaho. *Ecology* 46:765–780.
- Chilton, G.; Baker, M.C.; Barrentine, C.D.; Cunningham, M.A. 1995. White-crowned sparrow (*Zonotrichia leucophrys*). In: Poole, A.; Gill, F., editors. The birds of North America 183. Ithaca NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/183>> accessed August 2007.
- Christiansen, R.L. 2001. The Quaternary and Pliocene Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana. U.S. Geological Professional Paper 729-G. [Place of publication unknown]: U. S. Geological Survey. 145 p.
- Cole, D.N.; Knight, R.L. 1990. Impacts of recreation on biodiversity in wilderness. In: Wilderness areas: their impacts; proceedings of a symposium, [Date of workshop symposium unknown]; [Place of symposium unknown]. Logan, UT: Utah State University. 33–40.

- Colwell, M.A.; Jehl, J.R. 1994. Wilson's phalarope (*Phalaropus tricolor*). In: Poole, A.; Gill, F., editors. The birds of North America 183. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/083>> accessed May 2008.
- Connelly, J.W.; Schroeder, M.A.; Sands, A.R.; Braun, C.E. 2000. Guidelines to manage sage grouse populations and their habitats. Wildlife Society Bulletin 28:967–985.
- Cooper, D.J.; Dickens, J.; Thompson Hobbs, N.; Christensen, L.; Landrum, L. 2006. Hydrologic, geomorphic, and climatic processes controlling willow establishment in a montane ecosystem. Hydrological Processes 20:1845–864.
- Cooper, S.V. 1999. Plant associations of the Red Rock Lakes National Wildlife Refuge: abbreviated community descriptions to accompany vegetation map. Report to the U.S. Fish and Wildlife Service. On file at Montana Natural Heritage Program. Helena, MT.
- Cooper, S.V.; Jean, C.; Heidel, B.L. 1999. Plant associations and related botanical inventory of the Beaverhead Mountains Section, Montana. Report to the Bureau of Land Management. On file at Montana Natural Heritage Program. Helena, MT.
- Cronan, J.M. 1957. Food and feeding habits of the scaups in Connecticut waters. The Auk 74(4):459–468.
- Cullen, S.A.; Jehl Jr., J.R.; Nuechterlein, G.L. 1999. Eared grebe (*Podiceps nigricollis*). In: Poole, A.; Gill, F., editors. The birds of North America 433. Philadelphia: The Birds of North America, Inc. [Pages unknown].
- Dai, X.; Boutton, T.W.; Hailemichael, M.; Ansley, R.J.; Jeffup, K.E. 2006. Soil carbon and nitrogen storage in response to fire in a temperate mixed-grass savanna. Journal of Environmental Quality 35:1620–1628.
- Dechant, J.A.; Sondreal, M.L.; Johnson, D.H.; Igl, L.D.; Goldade, C.M.; Nenneman, M.P.; Euliss, B.R. 2003. Effects of management practices on grassland birds: short-eared owl. [Internet]. Revised December 12, 2003. Northern Prairie Wildlife Research Center Online. <<http://www.npwrc.usgs.gov/resource/literatr/grasbird/seow/seow.htm>> accessed June 2007.
- DeLong, A. 2002. Managing visitor use & disturbance of waterbirds: a literature review of impacts and mitigation measures. Appendix L. In: Stillwater National Wildlife Refuge Complex final environmental impact statement for the comprehensive conservation plan and boundary revision. Vol. 2. Portland OR: U.S. Department of the Interior, U.S. Fish and Wildlife Service, region 1. 114 p.
- Dobb, E. 1998. Reality check: the debate behind the lens. Audubon 1:44–51, 98–99.
- Dobkin, D.S.; Rich, A.C.; Pretare, J.A.; Pyle, W.H. 1995. Nest-site relationships among cavity-nesting birds of riparian and snowpocket aspen woodlands in the northwestern Great Basin. Condor 97:694–707.
- Dorn, R. D. 1969. Relations of moose, cattle, and willows in southwestern Montana. [master's thesis]. Bozeman, MT: Montana State University. 79 p.
- Dorn, R.D. 1970. Moose and cattle food habits in southwest Montana. Journal of Wildlife Management 34:559–564.
- Douglas, D.C.; Ratti, J.T.; Black, R.A.; Alldredge, J.R. 1992. Avian habitat associations in riparian zones of Idaho's Centennial Mountains. Wilson Bulletin 104:485–500.
- Dugger, B.D.; Dugger, K.M. 2002. Long-billed curlew (*Numenius americanus*). In: Poole, A.; Gill, F., editors. The birds of North America 628. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/628>> accessed May 2008.
- Dwire, K.A.; Kauffman, J.B. 2003. Fire and riparian ecosystems in landscapes of the western USA. Forest Ecology and Management 178:61–74.
- Dwire, K.A.; Kauffman, J.B.; Baham, J.E. 2006. Plant species distribution in relation to water-table depth and soil redox potential in montane riparian meadows. Wetlands 26:131–146.
- Egertson, C.J.; Kopaska, J.A.; Downing, J.A. 2004. A century of change in macrophyte abundance and composition in response to agricultural eutrophication. Hydrobiologia 624:145–156.
- Errington, P.L. 1961. Muskrats and marsh management. Lincoln, NE: University of Nebraska Press. 183 p.
- Esser, L.L. 1992. *Achnatherum richardsonii*. In: Fire effects information system. [Internet]. Revised June 29, 2007. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <<http://www.fs.fed.us/database/feis/>> accessed April 2007.
- Ferguson, S.H.; Bisset, A.R.; Messier, F. 2000. The influences of density on growth and reproduction in moose *Alces alces*. Wildlife Biology 6:31–39.
- Ferrel M.H.; Hauck, C.W.; Myer, R.C. 1981. Colorado Rail annual No. 15: Idaho–Montana issue. [Place of

- publication unknown]: Colorado Railroad museum. 216 p.
- Finch, D.M. 1989. Habitat use and habitat overlap of riparian birds in three elevational zones. *Ecology* 70:866–880.
- Finch, D.M.; Reynolds, R.T. 1987. Bird response to understory variation and conifer succession in aspen forests. In: Emmerick, J. et al., editors. Proceedings of issues and technology in management of impacted wildlife: Proceedings, [Title of proceedings unknown]; [Date of proceedings unknown]; [Place of proceedings unknown]. Colorado Springs, CO: Thorne Ecological Institute. 87–96.
- Fondell, T.F.; Ball, I.J. 2004. Density and success of bird nests relative to grazing on western Montana grasslands. *Biological Conservation* 117:203–213.
- Foresman, K.R. 2001. The wild mammals of Montana. Special Publication No. 12. Lawrence, KS: The American Society of Mammalogists. 278 p.
- Fox, A.D.; Madsen, J. 1997. Behavioral and distributional effects of hunting disturbance on waterbirds in Europe: implications for refuge design. *Journal of Applied Ecology* 34:1–13.
- Fredrickson, L.H.; Heitmeyer, M.E. 1991. Life history strategies and habitat needs of the northern pintail. In: Waterfowl Management Handbook. Washington DC: U.S. Fish and Wildlife Service. 8 p.
- Fuguitt, G.V. 1985. The nonmetropolitan population turnaround. *Annual Review of Sociology* 11:259–280.
- Gaillard, J.M.; Festa-Bianchet, M.; Yoccoz, N.G.; Loison, A.; Toïgo, C. 2000. Temporal variation in fitness components of large herbivores. *Annual Review of Ecology and Systematics* 31:367–393.
- Gallant, A.L.; Hansen, A.J.; Councilman, J.S.; Monte, D.K.; Betz, D.W. 2003. Vegetation dynamics under fire exclusion and logging in a Rocky Mountain Watershed, 1856–1996. *Ecological Applications* 13:385–403.
- Gangloff, M.M. 1996. Winter habitat and distribution of Arctic grayling in Upper Red Rock Lake, Red Rock Lakes National Wildlife Refuge, Montana. [master's thesis]. Bozeman, MT: Montana State University. 101 p.
- Gardali, T.; Ballard, G. 2000. Warbling vireo (*Vireo gilvus*). In: Poole, A.; Gill, F., editors. The birds of North America 551. Ithaca NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/551>> accessed May 2008.
- Geist, V.; Mahoney, S.P.; Organ, J.F. 2001. Why hunting has defined the North American Model of Wildlife Conservation. In: Transactions of the North American Wildlife and Natural Resources Conference: North American Wildlife and Natural Resources Conference, 2001, March 20; Washington, DC: [Name of publisher unknown]. 66:175–185.
- Geist, V.; Organ, J.F. 2004. The public trust foundation of the North American Model of Wildlife Conservation. *Northeast Wildlife* 58:49–56.
- Giles, L.; Holt, M.; Montgomery, C.; Rule, D., editors. 2006. Centennial Valley: a journey through time 1820–1930. Volume 1. Centennial Valley Historical Society. Butte, MT: Arcraft Printers. 30 p.
- Greater Yellowstone Coalition. 2006. The Greater Yellowstone Ecosystem. [Internet]. <<http://www.greateryellowstone.org/ecosystem/>> accessed 1 February 2009.
- Grinnell, G.B. 1913. Brief history of the Boone and Crockett Club. In: Grinnell, G.B., editor. Hunting at high altitudes. New York: Harper & Brothers. 422–491.
- Guzy, M.J.; Ritchison, G. 1999. Common yellowthroat (*Geothlypis trichas*). In: Poole, A.; Gill, F., editors. The birds of North America 448. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/448>> accessed May 2008.
- Hansen, A.J.; Rotella, J.J.; Kraska, M.P.V.; Brown, D. 2000. Spatial patterns of primary productivity in the Greater Yellowstone Ecosystem. *Landscape Ecology* 15:505–522.
- Hansen, P.L.; Pfister, R.D.; Boggs, K.; Cook, B.J.; Joy, J.; Hinckley, D.K. 1995. Classification and management of Montana's riparian and wetland sites. Miscellaneous Publication No. 54. Missoula, MT: University of Montana, School of Forestry, Montana Forest and Conservation Station. 646 p.
- Harris, S.W.; Marshall, W.H. 1963. Ecology of water-level manipulations on a northern marsh. *Ecology* 44:331–343.
- Hart, J.H.; Hart, D.L. 2001. Heartrot fungi's role in creating picid nesting sites in living aspen. In: Shepperd, W.D.; Binkley, D.; Bartos, D.L.; Stohlgren, T.J.; Eskew, L.G., compilers. Sustaining aspen in western landscapes: symposium proceedings. [Place of publication unknown]: USDA Forest Service Proceedings RMRS-P-18. 207–213.
- Harting A.; Glick D. 1994. Sustaining Greater Yellowstone, a blueprint for the future. Bozeman, MT: Greater Yellowstone Coalition. 63 p.

- Hauer, F.R.; Spencer, C.N. 1998. Phosphorous and nitrogen dynamics in streams associated with wildfire: a study of immediate and longterm effects. *International Journal of Wildland Fire* 8:183–198.
- Havera, S.P.; Boens, L.R.; Georgi, M.M.; Shealy, R.T. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin* 20:290–298.
- Heitmeyer, M.E.; Raveling, D.G. 1988. Winter resource use by three species of dabbling ducks in California. Report to the Department of Wildlife and Fisheries Biology, University of California, Davis, California. On file at Delta Waterfowl and Wetlands Research Center, Portage La Prairie, Manitoba, Canada.
- Hendricks, P.; Roedel, M. 2001. A faunal survey of the Centennial Valley Sandhills, Beaverhead County, Montana. Report to the U.S. Bureau of Land Management and U.S. Fish and Wildlife Service. Helena, MT: Montana Natural Heritage Program. 44 p.
- Herkert, J.R.; Simpson, S.A.; Westemeier, R.L.; Esker, T.L.; Walk, J.W. 1999. Response of northern harriers and short-eared owls to grassland management in Illinois. *Journal of Wildlife Management* 63:517–523.
- Heyerdahl, E.K.; Miller, R.F.; Parsons, R.A. 2006. History of fire and Douglas-fir establishment in a savanna and sagebrush–grassland mosaic, southwestern Montana, USA. *Forest Ecology and Management* 230:107–118.
- Hinds, T.E. 1985. Diseases. In DeByle, N.V.; Winokur, R.P., editors. *Aspen: ecology and management in the western United States*. USDA Forest Service General Technical Report RM-119. Fort Collins, CO: Rocky Mountain Forest and Range Experiment Station. 87–106.
- Holling, C.S. 1978. *Adaptive environmental assessment and management*. London: John Wiley and Sons. 377 p.
- Houston, D. B. 1968. The Shiras moose in Jackson Hole, Wyoming. Technical Bulletin 1. [Place of publication unknown]: Grand Teton Natural History Association. 110 p.
- Howard, Janet L. 1996. *Bromus inermis*. In: Fire Effects Information System. [Internet]. Revised 6 July 2007. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <<http://www.fs.fed.us/database/feis/>> [Access date unknown].
- Intermountain West Joint Venture 2005a. Coordinated implementation plan for bird conservation in western Montana. [Place of publication unknown]: Montana Steering Committee Intermountain West Joint Venture. 58 p.
- Intermountain West Joint Venture 2005b. Intermountain West Joint Venture coordinated bird conservation plan. [Place of publication unknown]: Intermountain West Joint Venture. 94 p.
- Jeppesen, E.; Søndergaard, M.; Christoffersen, K. 1998. *The structuring role of submerged macrophytes in lakes*. New York: Springer-Verlag. 423 p.
- Johnson, D.; Igl, L.D. 2001. Area requirements of grassland birds: a regional perspective. *The Auk* 118:24–34.
- Jones, J.R.; DeByle, N.V. 1985. Morphology. In: DeByle, N.V.; Winokur, R.P., editors. *Aspen: ecology and management in the western United States*. General Technical Report RM-GTR-119. Fort Collins, CO: U.S. Department of Agriculture, Forest Service. 11–18.
- Kadlec, J.A. 1962. Effects of a drawdown on a waterfowl impoundment. *Ecology* 43:267–281.
- Kadlec, J.A.; Smith, L.M. 1989. The great basin marshes. In: Smith, L.M.; Pederson, R.L.; Kaminski, R.M., editors. *Habitat management for migrating and wintering waterfowl in North America*. Lubbock, TX: Texas Tech University Press. 560 p.
- Kaeding, L.R.; Boltz, G.D. 1999. A study of Arctic grayling and their stream habitat in support of reserved water right applications, Red Rock Lakes National Wildlife Refuge, Montana. On file at U.S. Fish and Wildlife Service, Bozeman, MT.
- .2004. Use of remote-site incubators to produce Arctic grayling fry of wild parentage. *North American Journal of Fisheries Management* 24:1031–1037.
- Kaminski, R.M.; Prince, H.H. 1981. Dabbling duck and aquatic macroinvertebrate responses to manipulated wetland habitat. *Journal of Wildlife Management* 45:1–15.
- Kantrud, H.A. 1990. Sago pondweed (*Potamogeton pectinatus* L.): a literature review. Resource Publication 176. Washington DC: U.S. Fish and Wildlife Service. 89 p.
- Kantrud, H.A.; Higgins, K.F. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. *Prairie Naturalist* 24:67–84.
- Kaya, C.M. 1992. Review of the decline and status of fluvial Arctic grayling, *Thymallus arcticus*,

- in Montana. In: Proceedings of the Montana Academy of Sciences 1992; [Date of proceedings unknown]; [Place of proceedings unknown]. [Place of publication unknown]: [Publisher unknown]. 52:43–70.
- Keigley, R.B.; Frisina, M.R. 2001. Browse conditions at Red Rock Lakes National Wildlife Refuge. In: Knapp, S.J.; Frisina, M.R., editors. Statewide browse evaluation. Project Report No. 1. Helena, MT: Montana Fish, Wildlife and Parks, Wildlife Division, Habitat Bureau. 74 p.
- Keigley, R.B.; Frisina, M.R.; Fager, C. 2002. Assessing browse trend at the landscape level; part 2: monitoring. *Rangelands* 24:34–38.
- Kendall, W.L. 2001. Using models to facilitate complex decisions. In: Shenk, T.M.; Franklin, A.B., editors. Modeling in natural resource management: development, interpretation, and application. Washington DC: Island Press. 223 p.
- Kercheval, B. 1935. Detailed plans, Red Rock Lakes Migratory Bird Refuge, project of the Bureau of Biological Survey, February 19, 1935. Washington DC: Bureau of Biological Survey. 6 p.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin* 21:31–39.
- Knick, S.T.; Rotenberry, J.T. 1995. Landscape characteristics of shrubsteppe habitats and breeding passerine birds. *Conservation Biology* 9:1059–1071.
- Knight, R.L.; Cole, D.N. 1995. Wildlife responses to recreationists. In: Knight, R.L.; Gutzwiller, K.J., editors. *Wildlife and recreationists*. Covelo, CA: Island Press. 372 p.
- Korb, N.T. 2005. Historical fire regimes and structures of Douglas-fir forests in the Centennial Valley of southwest Montana. [master's thesis]. Fort Collins, CO: Colorado State University. 66 p.
- Korb N.T.; Bauer, B.D.; Keigley, R.B. 2008. Centennial Valley aspen assessment: evaluating stand structure and effects of herbivory. On file at the Nature Conservancy, Helena, MT.
- Korschgen, C.E.; George, L.S.; Green, W.L. 1985. Disturbance of diving ducks by boaters on a migrational staging area. *Wildlife Society Bulletin* 13:290–296.
- Krull, J.N. 1970. Aquatic plant-macroinvertebrate associations and waterfowl. *Journal of Wildlife Management* 34:707–718.
- Kruse, T.E. 1959. Grayling of Grebe Lake, Yellowstone National Park, Wyoming. *Fishery Bulletin* 149. Washington DC: U.S. Fish and Wildlife Service. 44 p.
- Lancia, R.A.; Braun, C.E.; Collopy, M.W.; Dueser, R.D.; Kie, J.G.; Martinka, C.J.; Nichols, J.D.; Nudds, T.D.; Porath, W.R.; Tilghman, N.G. 1996. ARM! For the future: adaptive resource management in the wildlife profession. *Wildlife Society Bulletin* 24:436–442.
- Lanphere, M.A.; Champion, D.E.; Christiansen, R.L.; Izett, G.A.; Obradovich, J.D. 2002. Revised ages of tuffs of Yellowstone Plateau volcanic field: Assignment of the Huckleberry Ridge Tuff to a new geomagnetic polarity event. *Geological Society of American Bulletin* 14:559–568.
- Leach, G. 1941. Comments from the Service Division of Fish Culture on stocking Red Rock Creek. Letter addressed to Fred Foster, U.S. Fish and Wildlife Service Assistant Regional Director, 15 July 1941. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Leonard, J.W. 1939. Feeding habits of the Montana grayling (*Thymallus montanus Milner*) in Ford Lake, Michigan: Proceedings, [Name of proceedings unknown]; [Date of proceedings unknown]; [Place of proceedings unknown]. In: *Transactions of the American Fisheries Society* 68:188–195.
- Lesica, P.; Cooper, S.V. 1997. Presettlement vegetation of southern Beaverhead County, Montana. On file at Montana Natural Heritage Program, Helena, MT.
- Lesica, P.; Cooper, S.V. 1999. Succession and disturbance in sandhills vegetation: constructing models for managing biological diversity. *Conservation Biology* 13:293–302.
- Lesica, P.; Cooper, S.V.; Kudray, G. 2005. Big sagebrush shrub-steppe postfire succession in southwest Montana. On file at Montana Natural Heritage Program, Helena, MT.
- Lowther, P.E. 2000. Pacific-slope flycatcher (*Empidonax difficilis*) and Cordilleran flycatcher (*Empidonax occidentalis*). In: Poole, A.; Gill, F., editors. *The birds of North America* 556. Ithaca NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/556a>> accessed May 2008.
- Lowther, P.E.; Celada, C.; Klein, N.K.; Rimmer, C.C.; Spector, D.A. 1999. Yellow warbler (*Dendroica petechia*). In: Poole, A., editor. *The birds of North America online*. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <http://bna.birds.cornell.edu/BNA/account/Yellow_Warbler/> [Access date unknown].
- Lund, J.A. 1974. The reproduction of salmonids in the inlets of Elk Lake, Montana. [master's thesis]. Bozeman, MT: Montana State University. [Pages unknown].

- Madsen J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. *Biological Conservation* 33:53–63.
- Madsen J. 1995. Impacts of disturbance on migratory waterfowl. *Ibis* 137:567–574.
- Martin, K.; Aitken, K.E.H.; Wiebe, K.L. 2004. Nest sites and nest webs for cavity-nesting communities in interior British Columbia, Canada: nest characteristics and niche partitioning. *Condor* 106:5–19.
- McEachern, P.; Prepas, E.E.; Gibson, J.J.; Dinsmore, W.P. 2000. Forest fire induced impacts on phosphorous, nitrogen, and chlorophyll A in boreal subarctic lakes of northern Alberta. *Canadian Journal of Fisheries and Aquatic Sciences* 57:73–81.
- Merrill, T.; Mattson, D.J. 2003. The extent and location of habitat biophysically suitable for grizzly bears in the Yellowstone region. *Ursus* 14:171–187.
- Mitchell, C.D. 1994. Trumpeter swan (*Cygnus buccinator*). In: Poole, A.; Gill, F., editors. *The birds of North America* 105. Ithaca NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/105>> accessed May 2008.
- Mitsch, W.J.; Gosselink, J.G. 1986. *Wetlands*. New York: Van Nostrand Reinhold. 539 p.
- Mogan, J. 1996. Status and biology of the spawning population of Red Rock Lakes' Arctic grayling. [master's thesis]. Bozeman, MT: Montana State University. 90 p.
- . 1996. *Montana Field Guide: Montana*. [Internet]. Revised March 23, 2009. <http://fieldguide.mt.gov/detail_AFCHA07010.aspx> accessed 23 March 2007.
- [MFWP] Montana Fish, Wildlife and Parks. 1995. *Montana fluvial Arctic grayling restoration plan*. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 1996. *The population of Arctic grayling in Upper Red Rock Lake*. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 2004. *Montana statewide elk management plan*. Helena, MT: Wildlife Division, Montana Fish, Wildlife and Parks. 397 p.
- . 2005. *The Montana comprehensive fish and wildlife conservation strategy*. On file at Montana Fish, Wildlife and Parks, Helena, MT.
- [MTNHP] Montana Natural Heritage Program. 2002. *2002 list of ecological communities for Montana*. On file at Montana State Library, Helena, MT.
- [MTNHP and MFWP] Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. 2006. *Montana animal species of concern*. Helena, MT: Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. 17 p.
- Morris, M.S.; Kelsey, R.G.; Griggs, D. 1976. The geographic and ecological distribution of big sagebrush and other wood Artemisias in Montana. In: *Proceedings of the Montana Academy of Science*. [Date of proceedings unknown]; [Place of proceedings unknown]: Proceedings of the Montana Academy of Sciences. 36:56–79.
- Morton, J.M. 1995. Management of human disturbance and its effects on waterfowl. In: Whitman, W.R.; Strange, T.; Widjeskog, L.; Whitemore, R.; Kehoe, P.; Roberts, L., editors. *Waterfowl habitat restoration, enhancement and management in the Atlantic Flyway*. 3rd ed. Dover, DE: Environmental Management Committee, Atlantic Flyway Council Technical Section, and Delaware Division of Fish and Wildlife. F59–F86.
- Morton, J.M.; Fowler, A.C.; Kirkpattick, R.L. 1989a. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management* 53(2):401–410.
- Morton, J.M.; Kirkpattick, R.L.; Vaughan, M.R.; Stauffer, D.F. 1989b. Habitat use and movements of American black ducks in winter. *Journal of Wildlife Management* 53:390–400.
- Mueggler, W.F.; Stewart, W.L. 1980. *Grassland and shrubland habitat types of western Montana*. General Technical Report INT-66. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 154 p.
- Muenschler, W.C. 1936. The germination of seeds of Potamogeton. *Annals of Botany* 50:805–821.
- Muller, M.J.; Storer, R.W. 1999. Pied-billed grebe (*Podilymbus podiceps*). In: Poole, A.; Gill, F., editors. *The birds of North America* 410. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/410>> accessed May 2008.
- Mullins, W.H.; Bizeau, E.G. 1978. Summer Foods of Sandhill Cranes in Idaho. *Auk* 95(1):75–178.
- Murkin, H.R.; Kadlec, J.A. 1986. Relationships between waterfowl and macroinvertebrate densities in a northern prairie marsh. *Journal of Wildlife Management* 50:212–217.
- Murkin, H.R.; Murkin, E.J.; Ball, J.P. 1997. Avian habitat selection and prairie wetland dynamics: a 10-year experiment. *Ecological Applications* 7:1144–1159.

- Nelson, P.H. 1954. Life history and management of the American grayling (*Thymallus signifer tricolor*) in Montana. *Journal of Wildlife Management* 18:324–342.
- Newlon, K. R. 2007. Red Rock Lakes National Wildlife Refuge vegetation mapping project. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Nielson, E.C.; Farnsworth, D.N. 1965. Soil survey handbook for Red Rock Lakes Migratory Waterfowl Refuge in survey area 061. Soil Conservation Service, Dillon Field Office. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- O'Neill, J.M.; Christiansen, R.L. 2004. Geologic map of the Hebgen Lake Teton Counties, Wyoming, and Clark and Fremont Counties, Idaho. U.S. Geological Survey Scientific Investigations Map 2816. [Place of publication unknown]: U.S. Geological Survey. [Pages unknown].
- O'Reilly, M. 2006. Relationships among moose abundance, willow community structure, and migratory landbirds at Red Rock Lakes National Wildlife Refuge. [bachelor of science thesis]. Bozeman, MT: Montana State University. 32 p.
- Oring, L.W.; Neel, L.; Oring, K.E. 2000. Intermountain West regional shorebird plan. Version 1.0. [Place of publication unknown]: [Publisher unknown]. 55 p.
- Owens, N.W. 1977. Responses of wintering brant geese to human disturbance. *Wildfowl* 28:5–14.
- Pampush, G.J.; Anthony, R.G. 1993. Nest success, habitat utilization and nest-site selection of long-billed curlews in the Columbia Basin, Oregon. *Condor* 95:957–967.
- Paulins S.L. 1984. Activity budgets of nonbreeding gadwalls in Louisiana. *Journal of Wildlife Management* 48:371–380.
- Paullin, D.G. 1973. The ecology of submerged aquatic macrophytes of Red Rock Lakes National Wildlife Refuge, Montana. [master's thesis]. Missoula, MT: University of Montana. 171 p.
- Payne, N.F. 1992. Techniques for wildlife habitat management of wetlands. New York: McGraw-Hill. 549 p.
- Pettit, N.E.; Naiman, R.J. 2007. Fire in the riparian zone: characteristics and ecological consequences. *Ecosystems* 10(5):673.
- Poole, K. G.; Stuart-Smith, K. 2004. Winter habitat selection by moose in the East Kootenay, British Columbia, final report. Aurora Wildlife Research, Nelson, British Columbia, Canada. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Ratti, J. T.; Kadlec, J. A. 1992. Intermountain West waterfowl-wetland concept plan. Portland, OR: U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 150 p.
- Rauscher, R.L. 1997. Status and distribution of the pygmy rabbit in Montana: final report. Bozeman, MT: Montana Department of Fish, Wildlife and Parks. 27 p.
- Raveling, D.G. 1979. The annual cycle of body composition of Canada geese with special reference to control of reproduction. *The Auk* 96:234–252.
- Redenbach, Z.; Taylor, E.B. 1999. Zoogeographical implications of variation in mitochondrial DNA of Arctic grayling (*Thymallus arcticus*). *Molecular Ecology* 8:23–35.
- Reiss, S.A. 1995. Sport in industrial America, 1850–1920. The American History Series. Wheeling, IL: Harlan Davidson, Inc. 178 p.
- Restani, M. 1991. Resource partitioning among three buteo species in the Centennial Valley, Montana. *Condor* 93:1007–1010.
- Rich, T.D.; Beardmore, C.J.; Berlanga, H.; Blancher, P.J.; Bradstreet, M.S.W.; Butcher, G.S.; Demarest, D.W.; Dunn, E.H.; Hunter, W.C.; Inigo-Elias, E.E.; Kennedy, J.A.; Martell, A.M.; Panjabi, A.O.; Pashley, D.N.; Rosenberg, K.V.; Rustay, C.M.; Wendt, J.S.; Will, T.C. 2004. Partners in Flight North American landbird conservation plan. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Revised March 2005. <http://www.partnersinflight.org/cont_plan/> accessed 1 April 2009.
- Ricklefs, R. E. 1977. On the evolution of reproductive strategies in birds: reproductive effort. *American Naturalist* 111:453–478.
- Ritchie, B. W. 1978. Ecology of moose in Fremont County, Idaho. *Wildlife Bulletin No. 7*. Boise, ID: Idaho Department of Fish and Game. 32 p.
- Romme, W.H.; Turner, M.G.; Wallace, L.L.; Walker, J.S. 1995. Aspen, elk, and fire in northern Yellowstone Park. *Ecology* 76:2097–2106.
- Rotenberry, J.T.; Patten, M.A.; Preston, K.L. 1999. Brewer's sparrow (*Spizella breweri*). In: Poole, A.; Gill, F., editors. *The birds of North America* 390. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. *Birds of North America Online*. <<http://bna.birds.cornell.edu/bna/species/390>> accessed May 2008.
- Rowland, M.M. 2004. Effects of management practices on grassland birds: greater sage-grouse. [Internet]. Revised August 12, 2004. Northern Prairie Wildlife Research Center Online. <<http://>

- www.npwrc.usgs.gov/resource/literatr/grasbird/grsg/grsg.htm> [Access date unknown].
- Rudzitis G. 1996. Wilderness and the changing American west. New York: Wiley. 240 p.
- Rusch, D.H.; DeStefano, S.; Reynolds, M.C.; Lauten, D. 2000. Ruffed grouse (*Bonasa umbellus*). In: Poole, A.; Gill, F., editors. The birds of North America 515. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/515>> accessed May 2008.
- Russell, O.; Haines, A.L. 1965. Osborne Russell's journal of a trapper. Lincoln, NE: University of Nebraska Press. 191 p.
- Sankey, T.T.; Montagne, C.; Graumlich, L.; Lawrence, R.; Nielsen, J. 2006. Twentieth century forest—grassland ecotone shift in Montana under differing livestock grazing pressure. *Forest Ecology and Management* 234:282–292.
- Schladweiler, P. 1974. Ecology of Shiras moose in Montana. On file at Montana Fish, Wildlife and Parks, Helena, MT.
- Schmutz, J. A.; Rockwell, R. F.; Peterson, M. R. 1997. Relative effects of survival and reproduction on the population dynamics of emperor geese. *Journal of Wildlife Management* 61:191–201.
- Schoennagel, T.; Veblen, T.T.; Romme, W.H. 2004. The interaction of fire, fuels, and climate across Rocky Mountain Forests. *Bioscience* 54:661–676.
- Schroeder, M.A.; Young, J.R.; Braun, C.E. 1999. Greater sage-grouse (*Centrocercus urophasianus*). In: Poole, A.; Gill, F., editors. The birds of North America 425. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/425>> accessed May 2008.
- Sears, J.W.; Fritz, W.J. 1998. Cenozoic tilt domains in southwestern Montana: interference among three generations of extensional fault systems. In: Faulds, J.E.; Stewart, J.H., editors. Accommodation zones and transfer zones: the regional segmentation of the Basin and Range province. Special Paper 323. [Place of publication unknown]: Geological Society of America. 241–247.
- Sedgwick, J.A. 1993. Dusky flycatcher (*Empidonax oberholseri*). In: Poole, A.; Gill, F., editors. The birds of North America 78. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/078>> accessed May 2008.
- Sempeski, P.; Gaudin, P. 1995. Habitat selection by grayling—I. Spawning habitats. *Journal of Fish Biology* 47:256–265.
- Servheen, C.; Sandstrom, P. 1993. Ecosystem management and linkage zones for grizzly bears and other large carnivores in the northern Rocky Mountains in Montana and Idaho. *Endangered Species Technical Bulletin* 18:3. Washington, DC: U.S. Fish and Wildlife Service. 8–13.
- Sharp, W.M. 1951. Environmental requirements of a freshwater marsh and the ecology of some aquatic plants. In: Proceedings, 1951 Northeast Game Conference; 23 February 1951; [Place of proceedings unknown]. [Place of publication unknown]: Proceedings of the Northeast Game Conference. 6 p.
- Sive, B.; Shively, D.; Pape, B. 2003. Spatial variation of volatile organic compounds associated with snowmobile emissions in Yellowstone National Park. Report to the National Park Service, 2003. On file at University of New Hampshire Climate Change Research Center, Durham, NH.
- Sonderegger, J.L.; Schofield, J.D.; Berg, R.B.; Mannick, M.W.; Weinheimer, G.W. 1982. The Upper Centennial Valley, Beaverhead and Madison counties, Montana: An investigation of resources utilizing geology, geological, geophysical, hydrochemical, and geothermal methods. Memoir 50. Montana Bureau of Mines and Geology. [Place of publication unknown]. 53 p.
- Sperry, C.C. 1922. Report on the Red Rock Lake District east of Monida (Beaverhead County) Montana, with recommendations for its improvement as a wild duck feeding ground. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Squires, J.R.; Anderson, S.H. 1995. Trumpeter swan (*Cygnus buccinator*) food habits in the Greater Yellowstone Ecosystem. *American Midland Naturalist* 133:274–282.
- Subcommittee on Rocky Mountain Trumpeter Swans. 2008. Pacific Flyway management plan for the Rocky Mountain population of trumpeter swans. Pacific Flyway Study Committee. [Internet]. Revised July 2008. <<http://www.pacificflyway.gov/Abstracts.asp#rmts>> [Access date unknown].
- Stacy, M.D.; Perryman, B.L.; Stahl, P.D.; Smith, M.A. 2005. Brome control and microbial inoculation effects in reclaimed cool-season grasslands. *Rangeland Ecology and Management* 58:161–166.
- Stevens, D. R. 1970. Winter ecology of moose in the Gallatin Mountains, Montana. *Journal of Wildlife Management* 34:37–46.
- Stewart, R.E.; Kantrud, H.A. 1973. Ecological distribution of breeding waterfowl populations in North Dakota. *Journal of Wildlife Management* 37:39–50.

- Storer, R.W.; Nuechterlein, G.L. 1992. Western and Clark's grebe. In: Poole, A.; Stettenheim, P.; Gill, F., editors. The birds of North America 26. Ithaca, NY: Cornell Laboratory of Ornithology. [Internet]. Birds of North America Online. <<http://bna.birds.cornell.edu/bna/species/026a>> accessed May 2008.
- Summer R.M. 1980. Impacts of horse traffic on trails in Rocky Mountain National Park. *Journal of Soil and Water Conservation* 35(2):85–87.
- Svejcar, T.; Riegel, G.M. 1998. Spatial pattern of gas exchange for montane moist meadow species. *Journal of Vegetation Science* 9:85–94.
- Tacha, T.C.; Nesbit, S.A.; Vohs, P.A. 1992. Sandhill crane (*Grus canadensis*). In: Poole, A.; Stettenheim, P.; Gill, F., editors. The birds of North America 31. Ithaca, NY: Cornell Laboratory of Ornithology. Birds of North America Online. [Internet]. <<http://bna.birds.cornell.edu/bna/species/031>> accessed May 2008.
- Taylor, J.F. 1991. Report on cultural resources inventory of four proposed project locations within the Red Rock Lakes National Wildlife Refuge. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Thines, N.J.; Shipley, L.A.; Saylor, R.D. 2004. Effects of cattle grazing on ecology and habitat of Columbia Basin pygmy rabbits (*Brachylagus idahoensis*). *Biological Conservation* 119:525–534.
- Thomas, R.C.; Sears, J.W.; Fritz, W.J.; Landon, S.C. 2000. Cenozoic extensional history of southwest Montana. *Geological Society of America*. 32:A–40.
- Thomas, V.G. 1982. Spring migration: the prelude to goose reproduction and a review of its implication. In: Boyd, H., editor. Fourth Western Hemisphere waterfowl and waterbird symposium: Proceedings of the International Waterfowl Research Bureau Symposium; 1983; Ottawa, ON, Canada: Canadian Wildlife Service. Special Publication. 73–81.
- Tirmenstein, D. 1999. *Artemisia tridentata* spp. *tridentata*. In: Fire Effects Information System, [Internet]. Revised July 8, 2007. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <<http://www.fs.fed.us/database/feis/>> [Access date unknown].
- Turchi, G.M.; Kennedy, P.L.; Urban, D.; Hein, D. 1995. Bird species richness in relation to isolation of aspen patches. *Wilson Bulletin* 107:463–474.
- Unthank, A. 1989. Historical overview of Red Rock Lakes National Wildlife Refuge grayling. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT. [Pages unknown].
- U.S. Census Bureau. 1999. Census Bureau: State and County QuickFacts for Montana. Data derived from 1999 Population Estimates. [Internet]. [Revision date unknown]. <<http://quickfacts.census.gov>> accessed June 2007.
- [USFWS] U.S. Fish and Wildlife Service. 1974–1975. Red Rock Lakes National Wildlife Refuge annual narrative 1974–1975. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 1978. Red Rock Lakes National Wilderness, an aquatic history, 1889–1977. On file at Kalispell Field Station, U.S. Fish and Wildlife Service. Creston, MT.
- . 1992. Environmental assessment for proposed termination of winter feeding of trumpeter swans at Red Rock Lakes National Wildlife Refuge. Lakewood, CO: Mountain-Prairie Region, U.S. Fish and Wildlife Service. 26 p.
- . 1994. Upland habitat management plan. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 1994–1995. Red Rock Lakes National Wildlife Refuge annual narrative 1994–1995. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 1997. A system for mapping riparian areas in the western United States. Arlington, VA: National Wetlands Inventory. 15 p.
- . 1999a. National Wetlands inventory website: U.S. Department of the Interior, Fish and Wildlife Service. [Internet]. [Revision date unknown]. <<http://www.fws.gov/nwi/>> accessed May 2007.
- . 1999b. Fulfilling the promise, the National Wildlife Refuge System. Arlington, VA: U.S. Department of the Interior, U.S. Fish and Wildlife Service. 101 p.
- . 2001. Centennial Valley Conservation Easement Program Plan. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 2002a. Fisheries program, a vision for the future. [Internet]. [Revision date unknown]. <<http://www.fws.gov/fisheries/CAF/Vision.htm#intro>> accessed 23 January 2008.
- . 2002b. Birds of conservation concern 2002. Arlington, VA: Division of Migratory Bird Management. 99 p.
- . 2004. Adaptive resource management plan for Lower Red Rock Lake, Red Rock Lakes National Wildlife Refuge. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 2005. The migratory bird program's focal species strategy: measuring success in achieving

- our existing bird conservation priorities and mandates. Arlington, VA: Division of Migratory Bird Management. 2 p.
- . 2008a. Moose winter survey data, 1966–2008. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 2008b. Midwinter waterfowl survey. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- . 2008c. Submerged aquatic vegetation surveys 2003–2008. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- U.S. Fish and Wildlife Service and Canadian Wildlife Service. 1986. North American waterfowl management plan: a strategy for cooperation. Washington, DC: U.S. Fish and Wildlife Service and Ottawa, Ontario: Canadian Wildlife Service. 19 p.
- [USGS]. United States Geological Survey. 2006. Classification of wetlands and deepwater habitats of the United States; emergent wetland. [Internet]. [Revision date unknown]. <<http://www.npwrc.usgs.gov/resource/wetlands/classwet/emergent.htm>> accessed 23 March 2009.
- Vander Haegen, W.M.; Dobler, F.C.; Pierce, J.D. 2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, U.S.A. *Conservation Biology* 14:1145–1160.
- Vander Haegen, W.M.; Schroeder, M.A.; DeGraaf, R.M. 2002. Predation on real and artificial nests in shrubsteppe landscapes fragmented by agriculture. *Condor* 101:496–506.
- Vincent, R.E. 1962. Biogeographical and ecological factors contributing to the decline of Arctic grayling, *Thymallus arcticus Pallas*, in Michigan and Montana. [PhD dissertation]. Ann Arbor, MI: University of Michigan. 169 p.
- Voigts, D.K. 1976. Aquatic invertebrate abundance in relation to changing marsh vegetation. *American Midland Naturalist* 95:313–322.
- Walker, B. 2004. Effects of management practices on grassland birds: Brewer's sparrow. [Internet]. Revised 12 August 2004. Northern Prairie Wildlife Research Center Online. <<http://www.npwrc.usgs.gov/resource/literatr/grasbird/brsp/brsp.htm>> accessed July 2007.
- Walker, R.; Craighead, L. 1997. Analyzing wildlife movement corridors in Montana using GIS. In: Proceedings, 1997 ESRI International User Conference; 1997 July 8–11; San Diego, CA. San Diego, CA: Proceedings of the 1997 ESRI International User Conference. [Internet]. ESRI. Revised 1997. <<http://proceedings.esri.com/library/userconf/proc97/proc97/to150/pap116/p116.htm>> [Access date unknown].
- Wallestad, R.O.; Pyrah, D.B. 1974. Movement and nesting of sage grouse hens in central Montana. *Journal of Wildlife Management* 38:630–633.
- Walters, C.J.; Holling, C.S. 1990. Large-scale management experiments and learning by doing. *Ecology* 71:2060–2068.
- Warren, J.M.; O'Reilly, M. 2005. Hunting district 334 winter moose survey data analysis. On file at Red Rock Lakes National Wildlife Refuge, Lima, MT.
- Welch, B.L.; Criddle, C. 2003. Countering misinformation concerning big sagebrush. Research Paper RMRS-RP-40. Ogden, UT: United States Department of Agriculture, Forest Service. 28 p.
- Weller, M.W. 1981. Freshwater marshes: ecology and wildlife management. Minneapolis, MN: University of Minnesota Press. 146 p.
- . 1999. Wetland birds. Cambridge, UK: Cambridge University Press. 271 p.
- Weller, M. W.; Fredrickson, L. H. 1973. Avian ecology of a managed glacial marsh. *Living Bird* 12:269–291.
- Weller, M.W.; Spatcher, C.E. 1965. Role of habitat in the distribution and abundance of marsh birds. Department of Zoology and Entomology Special Report 43. Ames, IA: Agricultural and Home Economics Experiment Station, Iowa State University. 30 p.
- White-Robinson, R. 1982. Inland and salt marsh feeding of winter brant geese in Essex. *Wildfowl* 33:113–118.
- Wiggins, D.A.; Holt, D.W.; Leasure, S.M. 2006. Short-eared owl (*Asio flammeus*). In: Poole, A., editor. The birds of North America online. Ithaca, NY: Cornell Laboratory of Ornithology. <http://bna.birds.cornell.edu/BNA/account/Yellow_Warbler/> accessed August 2007.
- Williams B.; Conway-Durver, L. 1998. Horse trails in ecological reserves. In: Proceedings, Clemson University Horse Trails Symposium. 1998 October 18–21; Clemson University, Clemson, SC. On file at Clemson University, Clemson, SC.
- Willson, G.D.; Stubbendieck, J. 1996. Suppression of smooth brome by atrazine, mowing, and fire. *The Prairie Naturalist* 28:13–20.
- . 1997. Fire effects on four growth stages of smooth brome (*Bromus inermis Leyss*). *Natural Areas Journal* 17:306–312.

- . 2000. A provisional model for smooth management in degraded tallgrass prairie. *Ecological Restoration* 18:34–38.
- Windell, J.T.; Willard, B.E.; Cooper, D.J.; Foster, S.Q.; Knud-Hansen, C.F.; Rink, L.P.; Kiladis, G.N. 1986. An ecological characterization of Rocky Mountain montane and subalpine wetlands. U.S. Fish and Wildlife Service Biology Report 86(11). 298 p.
- Winternitz, B.L. 1980. Birds in aspen. In: Workshop proceedings: management of western forests and grasslands for nongame birds: Proceedings of the workshop; 1980 February 11–14; Salt Lake City UT. Ogden, UT: U.S. Department of Agriculture, Forest Service. INT-GTR-86. 247–257.
- Wirth T.; Maus, P.; Powell, J.; Lachowski, H. 1996. Monitoring aspen decline using remote sensing and GIS: Gravelly Mountain Landscape, southwestern Montana. Salt Lake City, UT: Remote Sensing Steering Committee, U.S. Department of Agriculture, Forest Service. [Pages unknown].
- Wolder, M. 1993. Disturbance of wintering northern pintails at Sacramento National Wildlife Refuge, California. [master's thesis]. Arcata, CA: Humboldt State University. 62 p.
- Wood, A.K. 1993. Parallels between old-growth forest and wildlife population management. *Wildlife Society Bulletin* 21:91–95.
- Wright, H.A.; Klemmedson, J.O. 1965. Effect of fire on bunchgrasses of the sagebrush-grass region of southern Idaho. *Ecology* 46:680–688.
- Zimmer, K.D.; Hanson, M.A.; Butler, M.G. 2000. Factors influencing invertebrate communities in prairie wetlands: a multivariate approach. *Canadian Journal of Fisheries and Aquatic Sciences* 57:76–85.
- Zlatnik, E. 1999. *Hesperostipa comata*. In: Fire Effects Information System, [Internet]. Revised 6 July 2007. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <<http://www.fs.fed.us/database/feis/>> [Access date unknown].
- Zouhar, K.L. 2000. *Festuca idahoensis*. In: Fire Effects Information System, [Internet]. Revised 29 June 2007. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <<http://www.fs.fed.us/database/feis/>> [Access date unknown].

