



United States
Department of
Agriculture

Pacific
Northwest
Region

Forest
Service

April 2004



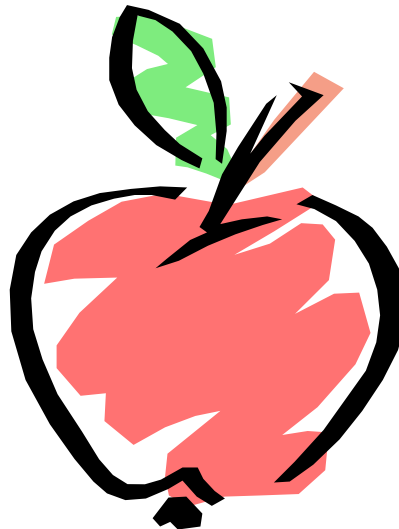
RECORD OF DECISION

Baked Apple Fire Salvage

NORTH UMPQUA RANGER DISTRICT

UMPQUA NATIONAL FOREST

DOUGLAS COUNTY, OREGON



Contents

Introduction	1
Purpose and Need for Action	2
Issues.....	3
Alternatives Considered in Detail	5
Decision and Changes between Draft and Final	8
Active vs. Passive Management.....	10
Meeting the Need for Action	11
How the Alternatives Address Issues and Reasons for Non-Selection	12
Cumulative Effects from Ongoing and Proposed Activities	22
Consultation with USFWS and NOAA.....	22
Forest Plan Consistency.....	23
Legal Requirements and Policy.....	23
Public Participation	25
The Environmentally Preferable Alternative	25
Mitigation Measures	26
Monitoring	26
Consistency with NFMA Requirements.....	28
Implementation	29
Appeal Rights.....	30
Contact Person.....	31

Introduction

This Record of Decision (ROD) documents my decision and rationale for the selection of the alternative to be implemented for the Baked Apple Fire Salvage Project. The Apple Fire, which started on August 16, 2002, burned 17,900 acres of early, mid, and late seral conifer forests on the North Umpqua Ranger District located on the west slope of the Cascade Mountains in southwest Oregon. This human-caused fire burned in steep terrain at a time when burning conditions were extreme.

The 2002 fire season was the largest in recorded history on the Umpqua National Forest. The acres burned by the Apple Fire in 2002 represent 20 percent of the total acres affected by fire on the Umpqua that year. In addition to the Apple Fire, thirteen other fires, all lightning caused, burned on the Umpqua National Forest and intermingled private lands in 2002. Together, the 2002 fires on the Umpqua resulted in 88,000 acres of various burn intensities, from high intensity stand replacement fires that burned tree crowns killing all the trees in a stand to low intensity ground fires that are often beneficial due to their thinning and fuel reduction effects. Many acres on the Umpqua also burned in a mosaic pattern of intermixed ground fire and stand replacement fire.

By the time the Apple Fire was contained on September 8, 2002 it had burned with high intensity (as a stand replacement fire) across 5,460 acres; burned with a mosaic pattern on almost 1,890 acres; and underburned over 9,560 acres. The Apple Fire burned within three land allocations established in the Record of Decision for amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (the Northwest Forest Plan). The affected land allocations include: late successional reserve (LSR), riparian reserve, and matrix. LSRs were established to provide for old-growth ecosystems and related natural processes. Riparian reserves were established for the protection and restoration of riparian-dependant species and as connectivity corridors for many terrestrial species in the intervening lands between the LSRs. The matrix land allocation was identified in the Northwest Forest Plan as locations where most of the timber harvest and silvicultural activity would take place, following applicable standards and guidelines. The Baked Apple project is located outside of the LSR land allocation, thus none of the 2,947 acres of timber that was stand replaced by the Apple Fire in the South Cascades LSR is included. I opted not to propose any salvage in the LSR land allocation, allowing the natural disturbance and recovery process to function. In addition, much of what was burned by the Apple Fire in the LSR was in a roadless area, which would have added more analysis and controversy. We needed to move rapidly.

The 13,925 acre planning area is located within the Panther Creek 6th field subwatershed, which defines the planning area. Panther Creek flows into the Wild and Scenic North Umpqua River, about 20 air-miles east of the community of Glide, Oregon. The planning area includes all or portions of sections 9, 10, and 14 through 36, T26S, R1E; sections 19 and 30, T26S, R2E; and sections 2 through 5, and 9 through 11, T27S, R1E, Willamette Meridian, Douglas County, Oregon.

I determined that proposed salvage actions and their effects could best be analyzed and disclosed to the public through an environmental impact statement (EIS) following the National Environmental Policy Act (NEPA). A Notice of Intent to prepare an EIS was published in the Federal Register on March 17, 2003. This was followed by an October 31, 2003 Notice of Availability in the Federal Register and release of the Baked Apple Fire Salvage Draft Environmental Impact Statement (DEIS). The Final EIS (FEIS) accompanies this Record of Decision.

Purpose and Need for Action

I established a two-fold purpose and need for this project: 1) recover the economic value of the fire-killed merchantable timber before its value is lost to deterioration and reforest the area, and 2) to reduce existing and created fuels in the burned area. Both of these are responsive to 1994 Northwest Forest Plan direction for the matrix land allocation as well as direction established in the 1990 Umpqua National Forest Land and Resource Management Plan for management areas 10 and 11 located in the planning area. Management areas 10 and 11 were established to produce timber in a sustained and cost-efficient basis (LRMP IV-128) and to produce big game winter range and timber in combination (LRMP IV- 132).

The Northwest Forest Plan framed the basis for management in the matrix land allocation following stand replacing events (ROD B-9). In the matrix allocation, the economic benefits of timber production will receive greater consideration, the commercial salvage of dead trees will be less constrained (compared to other land allocations), and replanting disturbed area will be a high priority. The watershed analysis (a process required as part of the Aquatic Conservation Strategy of the Northwest Forest Plan) for the Middle North Umpqua watershed, which includes Panther Creek, defined a desired future condition of a healthy, productive forest that will provide a range of forest commodities. For matrix lands, the watershed analysis emphasized the provision of a predictable and sustainable level of timber into the future using a scientifically sound and ecologically credible plan (Middle North Umpqua Watershed Analysis p. 114). Two basic components establish the foundation for this management goal. The first component recommended in the watershed analysis is to re-establish landscape patterns associated with the local, natural disturbance

regime. The second component is to manage stand structure and species diversity to fit the potential of the land. In doing so, forested landscape areas would contain a broad range of forest types, structures, and patterns indicative of its fire regime (Middle North Umpqua Watershed Analysis p. 115). The Aquatic Conservation Strategy, an integral aspect of the Northwest Forest Plan, is based on natural disturbance processes watershed analysis is used to help provide the context for projects.

Salvaging some of the merchantable fire-killed timber from more than 2,000 acres of killed merchantable timber in the planning area and reforesting the area complies with direction in the Northwest Forest Plan and moves the existing condition of a burned landscape toward the desired condition of a forested landscape capable of supporting timber production.

Fuel treatments are based on the need to reduce activity-generated and existing dead fuels in order to keep fuel loads within parameters prescribed under Forest policy. Currently, fuel loads within some of the areas burned by the fire exceed acceptable levels. If all of this biomass were left standing, within 25 years, it is predicted that hundreds of tons of fuels would cover the ground on areas that currently have high fuel loads. Salvage activities would reduce the fuels that were created by the fire. Treating the created fuels would reduce these additional fuels to a level that would reduce the risk of contributing to future fire intensity and spread.

I established an interdisciplinary team to help me develop a salvage proposal to meet the purpose and need. Experts from two Ranger Districts carried out extensive field reconnaissance, formal inventories, and public involvement in order to develop the proposed action. Once the proposed action was developed, I initiated the NEPA process, including scoping, which continued the extensive public participation effort.

In brief, the proposed action included salvage on 1,075 acres with various levels of dead tree retention, treatment of logging created fuels using a variety of specific methods, road work on some timber haul routes, reforestation in both matrix and riparian reserve allocations, and site-specific mitigation measures and KV projects. Scoping on this salvage proposal generated a number of potential conflicts over the uses of natural resources, referred to as issues in NEPA.

Issues

In response to the proposed action, eight significant issues were identified by the public and the Forest Service. Significant issues were then used to develop

alternatives to the Proposed Action. These issues found in Chapter 1 on pages 14-16 in the FEIS are:

Current and Future Down Wood Availability

Dead trees have multiple ecological roles including functioning as an important element in biological and physical processes, and providing for future soil and site productivity. The concern raised is that the salvage logging will decrease the current and future availability of down, dead woody material as trees that have commercial value are salvaged.

Late Successional / Old-Growth Stand

Some stands that experienced a less intense burn still function as late-successional habitat. The concern raised is that the proposed salvage in these stands has the potential to impact late-successional/old growth stands as logging corridors and landings result in the felling or damage to live trees in these underburned areas.

Stand Structure and Diversity

Dead trees, either standing or down on the forest floor, represent an important component of forest diversity. Many members of the public raised a concern associated with the 1995 Beschta et. al publication that salvaging will decrease stand structure and diversity by removing dead trees greater than 20 inches in diameter at breast height (dbh) or removing dead trees greater than one hundred fifty years of age; and will decrease size class diversity by salvaging more than 50% of the dead trees within each size class.

Sediment

Salvage logging can increase the sedimentation of streams already impacted by fire. The concern raised was that the proposed salvage and related activities have the potential to impact some of the beneficial uses of the aquatic system through increased delivery of sediment to Panther, Limpy, Fairy, and Bachelor Creeks and their associated tributaries.

Economics

The proposed use of helicopter logging may result in low or no returns to the treasury or may not be economically feasible. The concern raised was that high costs of the proposed helicopter logging would reduce the amount of money returned to the federal treasury and reduce the amount of money available for restoration projects funded through Knudsen-Vandenberg funds. In addition, helicopter logging may not attract timber sale bidders.

Fuel loads

The areas not proposed for salvage (especially those designated as unplantable) and other untreated areas (including riparian reserves), will have high fuel loads in the future, increasing future fire risk. As time passes, it is estimated that 60-100 tons per acre of biomass (or more) will fall to the ground as the trees killed by the fire deteriorate. The concern raised was that if a fire were to occur and escape initial suppression, this high fuel loading would increase the risk of a high severity fire.

Low road density areas

Several groups (Umpqua Watersheds, Cascadia Wildlands, ONRC, and others) state that a 1,300-acre uninventoried roadless area lies within and adjacent to the headwaters of Limpy Creek and a 1,700 acre roadless area lies along the Wild and Scenic Corridor and in the Horseshoe Bend area. The Middle North Umpqua Watershed Analysis (USDA 2001, page 103) displays these areas as having low road densities, ranging from 0 to 1.5 miles of road per square mile of land. Although roadless designation is outside the scope of this project (it is decided at the Forest Plan or higher level), the concern raised was that the proposed project has the potential to impact the lands within these low road density areas.

Landbirds

Burning of logging-created fuels is best conducted (for soil protection) during the spring-time. The concern raised was that burning of logging-created fuels during the spring may impact landbirds slated for consideration and protection under the USDA Forest Service Landbird Strategic Plan (2002).

Four additional issues were considered in the assessment of effects, but were not used as the basis for alternative development as they were resolved in other ways (see FEIS, Chapter 1).

In addition to the above issues, five additional issues were considered that did not lead to the development of alternatives. These issues and their mitigation, where applicable, are discussed on pages 16-17 in Chapter 1 in the FEIS.

Alternatives Considered in Detail

Five action alternatives and a no action alternative were analyzed in detail in the FEIS pages 21-54. Alternatives considered include:

Alternative 1: No Action

No salvage would occur throughout the Panther Creek subwatershed and existing fuel loads would remain. Reforestation of burned areas would not

occur with KV funding. No temporary spur roads would be constructed and no road reconstruction of Road 4714 would occur. No logging-created fuels would be generated.

Alternative 2: Proposed Action

The proposed action was developed to meet the purpose and need. This alternative would salvage approximately 1,075 acres of burned stands within the Panther Creek subwatershed that, prior to the fire, were late-seral or mid-seral forest, retaining between 6 and 12 trees per acre for shade, large wood, and snag habitat; reforest and protect seedlings on acres that were salvaged; treat logging-created fuels; complete haul-related road work that includes commercial use of 55 miles of road, reconstruction (replacing plugged culverts and stabilizing slopes) of 2 sites along Forest Service Road 4714; construction (about 0.80 miles) and reconstruction (about 0.44 miles) of temporary spur roads, reconstruction or expansion of up to 36 landings, construction of about 3 new landings, and use of 2 existing rock pits to facilitate logging and log haul. The areas prescribed for salvage would utilize a combination of helicopter, skyline and ground-based harvesting equipment. Felling of 2 snags per acre on all salvage units would occur to maintain soil productivity.

Alternative 3: Sediment and Site Productivity (Issues 1 and 4)

This alternative was developed to address the sediment issue and it differs from the proposed action by further focusing on maintaining soil productivity while reducing the potential of accelerated sedimentation to the aquatic system due to salvage. Soil productivity concerns were addressed by leaving additional ground cover (in the form of logging-created fuels) to provide short-term recruitment of organic matter and to provide effective ground cover to reduce the potential of surface erosion that could contribute sediment into the aquatic system. Long-term soil productivity issues were addressed by retaining between 4-16 trees per acre greater than 30 inches diameter. Nine units would retain 4 trees per acre; two units would retain 6 trees per acre; 51 units would retain 15 trees per acre; and two units would retain 16 trees per acre to recruit large wood over time based on plant association group determination (see description below in Alternative 6).

This alternative eliminated eight units that were in the proposed action, in order to retain large wood in areas where landslides may potentially occur. The units were also eliminated to reduce the risk of surface erosion. Logging-created fuels treatments were modified from underburning to hand pile burning in eleven units to maintain higher levels of effective groundcover, further reducing the risk of sedimentation from surface erosion.

Alternative 4: Economics, Fire Risk, and Future Fuels Loads (Issues 5 and 6): This is the Forest Service's Preferred Alternative.

This alternative differs from the proposed action by focusing on maximizing economic efficiency. In the proposed salvage units that are the same as the proposed action, 6 trees per acre would be retained (the Forest Plan Standard and Guideline for large wood would be met). In the DEIS, areas that were considered difficult to reforest and not included in the proposed action (Alternative 2) were included in this alternative in order to reduce fuels; these areas would retain 12 trees per acre to provide for future large wood, soil productivity and shade. In the FEIS, these areas were eliminated; as a Forest Plan Amendment would have been needed (none was proposed). Areas along roads were mapped to identify where hazard trees could be felled and removed by salvage. Logging systems were refined to maximize skyline and loader logging opportunities. To address fuels concerns, a prescription was developed for portions of riparian reserves adjacent to salvage units to harvest trees on 32 acres and to hand treat fuels on 202 acres.

Alternative 5: Retention of Snags, Large Wood, Ecosystem Recovery, and Low Road Density Areas (Issues 2, 3 and 7)

This alternative differs from the proposed action by retaining high levels of snags and down wood, and by avoiding salvage in low road density areas. The silvicultural prescriptions are based on the recommendations made by Beschta, et.al. (1995). Alternative 5 would use a 30-inch diameter limit in all salvage units to represent 150 year-old trees. In addition, 50% of all snags would be left standing in all diameter classes under 30 inches. Only skyline and loader logging are proposed in this alternative. All proposed helicopter logging was dropped from this alternative to address worker safety concerns. The stands with the highest burn severity were also eliminated from consideration, especially those within Limpy Creek, as these areas are most susceptible to salvage-related impacts. No temporary spur road building is proposed for this alternative. No planting would occur in late seral riparian reserves to achieve diversity of vegetation type. All proposed salvage units would be hand piled and burned. This alternative also eliminates salvage units within the intensely burned Limpy Creek area and within the Horseshoe Bend low road density areas that groups such as Oregon Natural Resources Council and Umpqua Watersheds consider as uninventoried roadless areas that are at least 1,000 acres in size.

Alternative 6: Restoring and Maintaining Landscape Patterns (Issues 1, 2, 3, 4, 5, 6, and 8)

This alternative differs from the proposed action by focusing salvage in areas that historically experienced higher intensity fires. This alternative ties into restoring and maintaining landscape patterns recommended in the Middle North Umpqua Watershed Analysis (pg. 119). It focuses salvage in a "Steep/Dry"

Landscape Area and refines the perimeter of this Landscape Area, which was recommended for even-age management in the Watershed Analysis, with an 80-120 year rotation. Alternative 6 also eliminates some units or portions of units that contain primarily green trees. In total, 26 units would be eliminated from this alternative compared to the proposed action.

Strategic fuel breaks were identified along the perimeter of the Steep/Dry landscape area. Additional units were also identified to be strategic fuel breaks and would retain 4 trees per acre. Several units that had previously experienced salvage would retain higher trees per acre, similar to those trees retained under the Beschta recommendations. These units would be hand pile burned to reduce impacts to landbirds.

A guideline for retaining trees according to Plant Association Groups (PAGs) was developed to achieve future down wood needs in the largest diameter classes (FEIS p.121). In dry Douglas-fir PAGs, 4 trees per acre greater than 30 inches in diameter would be retained (or if 30 inch trees are not available the largest trees in the stand would be retained at a minimum of 4/acre) to meet the 100-year desired condition of 98 lineal feet per acre of down wood and 1.5 snags per acre. This retention level, when added to existing levels that would be retained, would exceed Forest Plan Standards and Guidelines for the current condition. In the dry western hemlock PAG's, 15 trees per acre greater than 30 inches in diameter would be retained to meet the 100-year desired condition of 504 lineal feet per acre of down wood and 2 snags per acre.

Decision and Changes between Draft and Final

I have decided to implement Alternative 6 as described in the Final Environmental Impact Statement (FEIS). Some aspects of Alternative 6, as detailed in the DEIS have been changed in the FEIS. The modifications of Alternative 6 now incorporated into the FEIS are:

All 18 acres of harvest on lands found to be unsuitable due to poor regeneration potential have been dropped from Alternative 6. The dropped units are 25B, 49, 72, 73, 75, 86, and 87. This change in Alternative 6 between the draft and final EIS equates to a decrease of about 1 million board feet of timber. The total harvest volume for Alternative 6 in the FEIS is now estimated at 41.5 million board feet.

The two road repair sites on the 4714 road, included under all the action alternatives except Alternative 6 in the DEIS, have been added to Alternative 6 in the FEIS.

All KV projects not specifically detailed in the body of the DEIS, but addressed as projects that would require a separate decision as described in the

silvicultural prescription in the Appendix of the DEIS, are dropped from Alternative 6 in the FEIS. The dropped KV projects include road decommissioning, road reconstruction, and fuel reduction in unmerchantable plantations near the salvage units. None of the required KV which includes all work associated with reforestation that is specifically described and disclosed in the FEIS, will be dropped.

My decision to drop all salvage harvesting in unsuitable soils was prompted by written input and discussions with some members of the public during the 45-day DEIS review and comment period. Concerns focused on the impacts to site productivity from salvage of burned timber that would otherwise be available to eventually add soil organic matter, improve site growing conditions, and hasten natural regeneration on sites that are too rocky and shallow to effectively plant. Also I dropped all salvage harvesting on these unsuitable soils because a project-level Forest Plan amendment would be required and such an amendment was not proposed in the DEIS.

My decision to add the two road reconstruction sites to Alternative 6 in the FEIS is based on the existing condition of damaged and plugged culverts combined with inherent slope instability posing substantial risk of environmental impact. All the other action alternatives included these two repair sites because those alternatives would have hauled timber over these sites and the repairs were necessary in order to safely haul on the 4714 road. Alternative 6 will not haul on the 4714 road so the timber sale contract will not be used to pay for the repairs. Regardless, I will pursue other means to pay for this work.

My decision to drop the KV projects listed in the silvicultural prescription of the DEIS, that were not specifically analyzed in the EIS, is based on Forest Service Handbook direction. Due to truncated timeframes for the development of this EIS, the IDT was not able to thoroughly define the specifics of these KV projects and the potential effects of these connected actions in the analysis. Therefore I am compelled to drop them for lack of required analysis (FSH 2409.19).

The 18 acres of dropped harvest in unsuitable soils and the dropped KV projects have together resulted in changes in the economic analysis between the Draft and the Final EIS. The \$1,205,504 KV costs factored into the economic analysis of Alternative 6 in the DEIS has declined by 40 percent, down to \$713,441. The timber volume reduction from the dropped 18 acres resulted in a decline in gross benefit of nearly half a million dollars. However, all things considered, the total return to the United States treasury under Alternative 6 is slightly more in the FEIS than the DEIS economic analysis, \$10,085,847 compared to \$9,806,274, an increase of \$279,573 in the FEIS. A similar small increase in the present net value (PNV) is also a result of the above modifications; \$9,204,127 was the PNV in the modified Alternative 6 in the FEIS compared to a PNV of \$8,903,469 for Alternative 6 in the DEIS.

Active vs. Passive Management

A concern that arose early in the process was whether or not to pursue active management in the burned area. Scientific literature was brought forward early in scoping. A large number of the scoping comments asked that we follow the recommendations from a 1995 paper by eight scientists titled “Wildfire and Salvage Logging—recommendations for ecologically sound post fire salvage management and other post-fire treatments on Federal lands in the west” (Beschta et.al. 1995). The authors of the Beschta Report provide their opinions on the issue of salvage logging in the form of general principles and recommendations. It is important to note that no scientific experiment or case study was conducted for preparation of the paper. The authors present their suggested policy principles and land management recommendations as generally applicable to Federal lands throughout the western United States, or at least the Interior Columbia and Upper Missouri Basins. The majority of the recommendations found in the Report recommend no active intervention. The report is centered on the idea that natural patterns and processes provide the best pathway to recovery.

In response to Beschta et al., the science team leader of the Forest Service Wenatchee Forestry Sciences Lab states that the “custodial” approach advocated by Beschta may in many cases be less desirable than more active management...because of possible fuel buildup in the absence of timber harvest Everett (1995).” Dr. Everett also stated that every post-fire situation is different and should be handled on a case-by-case basis. Since then, several other scientists have also weighed in on both sides of the debate over active vs. passive management.

The post fire salvage logging debate prompted McIver and Starr (2000) to review and discuss the existing body of scientific literature on logging following wildfire and found that information on the environmental effects of post-fire logging to be scanty at best. Only 21 studies have examined the wide range of post fire logging. Some of the findings from this literature review were relevant to the Baked Apple project and were helpful in focusing the planning and analysis in the Baked Apple EIS. Examples of relevant findings from this literature review include: logging on steep, sensitive soils is likely to have the greatest potential for exacerbating the erosion problems typically observed in burned watersheds; ground based logging causes the greatest immediate soil effects; logging residue can decrease erosion in post-fire logging sites; and post fire logging removes dead wood structure affecting wildlife, especially cavity nesting birds. McIver and Starr (2000) found that no studies have specifically looked at how post fire logging alters the size distribution of fuels and associated changes in future fire risk.

In my judgment, active management is the responsible course of action specifically for the Baked Apple project located in the matrix land allocation. I

base this on the economic need for immediate intervention. Meeting an economic objective is valid since Forest Plan decisions specify timber production as a goal in this land allocation. I also recognize the controversy surrounding the potential of a future fire and the effects of fuel accumulations, but fuel reduction remains subordinate to economics in my decision to apply active management.

After I concluded that active management was appropriate, I weighed the pros and cons of each alternative based on how well the alternatives met the purpose and need and how they addressed the significant issues. The following is a discussion of those factors and my conclusions.

Meeting the Need for Action

The Need to Recover the Economic Value of Fire-Killed Timber and to Reforest Burned Areas

All of the action alternatives respond to the need to salvage and to reforest following the fire, but to varying degrees. Alternatives 2, 4 and 6 all closely respond to the salvage and reforestation element of the purpose and need; all three harvest more than 40 million board feet of timber, while Alternatives 3 and 5 salvage substantially less. Though Alternative 6 salvages fewer acres than Alternative 2 (158 fewer) and Alternative 4 (348 fewer), and it reforests fewer acres than Alternative 2 (74 fewer) and Alternative 4 (312 fewer), I feel Alternative 6 responds very adequately to the need for salvage and reforestation; this is especially true given the way that Alternative 6 responds to a number of the issues, as discussed later.

The Need to Reduce Existing and Created Fuels in the Burned Area

All the action alternatives respond in varying degrees and in different ways to the need for hazardous fuels reduction, yet Alternative 6 is best at minimizing future fires. The FARSITE model used by the interdisciplinary team to analyze this element of the purpose and need revealed that Alternative 6 would likely result in a smaller-sized fire, if one were to start in about 25 years, compared to all other alternatives. Alternative 6 leaves a wider range of fuel loads in salvage units than the other action alternatives, but it includes the application of fuel breaks in strategic locations, which is responsive to the overall objective of this element of the purpose and need.

How the Alternatives Address Issues and Reasons for Non-Selection

Alternative 6 has clear advantages over some of the other alternatives in responding to several of the significant issues. Alternative 6 was developed as a result of the May 5 and May 6, 2003 interdisciplinary team meetings where 18 members of the public commented on the five alternatives that had been developed to that point. As a result of these public and interdisciplinary team discussions, we developed Alternative 6 which blended aspects of the other action alternatives to create Alternative 6.

Alternative 6 focuses on the watershed analysis recommendation of restoring and maintaining landscape patterns associated with the local, natural disturbance regime. Alternative 6 focuses salvage in the “Steep/Dry” Landscape Area described in the watershed analysis as naturally prone to stand-replacement fire, and it refines the perimeter of this landscape area to fit the 2002 stand-replacement event. In keeping with the theme of restoring landscape patterns associated with the natural disturbance regime of the area, Alternative 6 does not salvage in the moderate or gentle/moist landscape area where, as predicted in the watershed analysis, the fire burned primarily as a ground fire in larger, older stands killing individual trees and small pockets of stand replacement.

Current and Future Dead Down Wood Availability

Alternative 6 strikes the best balance between dead tree retention for ecological functions and fuel reduction to reduce future fire risk. Alternative 6 does this by leaving a broad range of dead trees in the various salvage units.

The oldest, most decayed logs (decay class 4 and 5) in our inventoried old-growth stands provided the basis for the retention levels prescribed in Alternative 6. The large wood we leave today will become the decay class 4 and 5 logs in our salvage units in about 100 years, and the management goal is to approximate the levels we have found in our old-growth inventories. Decay rates and fall down rates were used to work our way forward in time to when these fire-killed stands will be about 100 years old and beginning to once again provide large down wood to the forest floor. The lowest level of dead tree retention will be 4 trees per acre in the steep, dry Douglas-fir plant association group where naturally frequent fire results in inherently lower levels of down wood on the forest floor. On the other hand, an average of 15 dead trees will be left per acre in the western hemlock plant association groups where there is typically more accumulated dead wood on the forest floor due to better site growing conditions and less frequent fire.

In addition, Alternative 6 goes beyond these retention levels in 106 acres where higher levels of leave trees are prescribed. This additional retention, ranging

from 24 to 175 leave trees per acre, will occur on units that were partially harvested in the past, so they have pre-existing lower wood levels due to management-related disturbances.

Alternative 3 employs the same methods to derive the leave tree prescriptions as Alternative 6, but it does not include higher retention levels following recommendations from Beschta et al. (1995), nor does it include strategic fuel breaks to help future suppression efforts slow the expansion of fire in this fire-prone landscape.

The retention levels associated with Alternatives 2 and 4 were largely driven by silvicultural objectives of providing shade from dead tree boles. While consistent with standards and guidelines, the retention levels in Alternative 2 and 4 are not based upon the natural disturbance regime, plant association groups, or the coarse woody debris dynamics model (Mellon and Ager 2003). The broad range of leave trees provided by Alternative 6, tailored to specific site conditions, was an important factor in my decision to select Alternative 6 over the other alternatives.

Alternative 5 leaves much higher levels of dead tree retention based on recommendations made by Beschta, et al. (1995). The levels prescribed in Alternative 5 range from 42 to 188 trees per acre which is problematic in terms of carrying too much risk and potentially leading to larger, more severe fires in the future. Similarly, the no action alternative would result in substantial future fire risk. These are risks I am not willing to take in the matrix land allocation.

In response to the DEIS, some commenters found that the snag retention levels were excessive, exceeded forest plan requirements, and jeopardized the future survivability of the conifer forest. I share the concern about risks to future recovering forest stands should we get a future large fire. However, the snag levels usually left during forest management actions are minimums that assume the widespread availability of live trees, which can develop into or be used to create future snags. Following a high intensity fire, adequate numbers of live trees are not available. In this site-specific case, leaving additional snags makes sense, and it is fully consistent with the Forest Plan.

Other commenters felt that I should retain most or all of the larger, dead trees since it will take so long for a forest to grow back and provide the renewable supply of large down logs required by the Northwest Forest Plan. The retained trees in Alternative 6 will represent the largest size classes which are likely to persist well into the development of new stands. Future reburns may diminish that number, but leaving too much can lead to net losses of down wood on the landscape due to larger reburns.

In selecting Alternative 6 I have weighed the risks of contributing to future reburns against the role of large dead wood as habitat components to bridge the gap from today when ample wood is available, until future stands begin to add new dead wood. I feel that Alternative 6 does the best job of addressing and balancing the trade-offs surrounding this conflict. At the landscape scale, Alternative 6 maintains current levels of dead and down wood within the natural range of variability with well distributed patches of unsalvaged dead stands remaining on about 24% percent of the planning area. It also retains most of the scattered mortality within the moderate and moist Landscape Areas as biological legacies where it makes the most ecological sense to do so.

Late Successional / Old-Growth Stands

Alternative 6 addresses the issue of salvage within live, late seral /old-growth stands best among the action alternative. The concern is over the salvage of relatively small pockets of dead trees from within live, functioning late-successional/old growth habitat and the associated damage to that habitat, and the live trees that would need to be felled or that would be damaged during the process of removing dead trees. This is addressed in Alternative 6 by only harvesting 33 acres of dead trees from within stands that have a lot of live trees. The other action alternatives (2, 3, 4, and 5) are all quite conservative in the amounts of salvage in such stands, but they all harvest more (57 acres, 50 acres, 137 acres, and 112 acres, respectively) than Alternative 6 does.

During the DEIS comment period, some people noted the importance of live trees to recovering habitat while others wanted to move into green timber areas that were underburned to get ahead of the bug infestations, which they predicted would explode over the next several years.

I am aware that many fire injured trees in the Apple Fire are damaged enough to predispose them to insect infestation and death. That process has already begun. Yet as disclosed by Dr. Goheen (of the SW Oregon Insect and Disease Technical Center) in the FEIS, bark beetle populations were at low levels when the fire started in 2002, and there is not a strong likelihood that a significant number of healthy vigorous trees either inside or outside the fire perimeter would be infested and killed (FEIS p.188). Also, based on Dr. Goheen's suggestion and offer to help, I have included a monitoring element as part of this decision that will track tree mortality and insect populations. This decision does not preclude taking future action should monitoring show more of a problem than predicted in the FEIS. Meanwhile, additional insects and tree death will enrich habitat for a myriad of species; an important process that occurs following fire. Finally, by narrowing the scope of this project strictly to dead trees, I effectively streamlined the planning process so that salvage could occur at the earliest possible time given the planning regulations I must follow.

I did not have the staff, the funding, or the time to expand the project into the realm of injured trees.

Alternative 6 fully addresses the issue of impacts to old growth habitat and green trees. I have concluded that the limited benefits of logging these small scattered pockets of dead trees do not outweigh the costs of doing so in terms of old growth impacts and economic returns.

Stand Structure and Diversity

Alternative 6 partially addresses the issue of maintaining structural diversity by using the widest variety of leave tree prescriptions. This issue triggered more letters during the scoping process than any other. The concern was that salvaging would decrease stand structure and diversity by removing the largest dead trees and various other size classes of dead trees. Alternative 5 was developed to address this issue by using a 30-inch diameter limit in all salvage units to represent 150 year-old trees referenced in the Beschta et al report. In addition, 50% of all snags would be left standing in all diameter classes under 30 inches. Thus, Alternative 5 responds to this issue the best of all action alternatives.

Some commenters cited a variety of ecological reasons to retain higher levels of dead trees while others expressed concern for worker safety, increased risk of larger fires in the future, and loss of economic opportunity associated with higher levels of retention.

I did not choose Alternative 5 because it was not responsive enough to the purpose and need in terms of capturing economic value, reforestation, and reducing fuels. Alternative 5 would only plant 220 salvage acres, it would only produce just over 5 million board feet, and it would leave too much fuels potentially leading to larger, more severe fires in the future. Alternative 6, on the other hand would reforest 864 acres of salvage units, salvage an estimated 41.9 million board feet of timber, and result in a future fire modeled to be 324 acres less (after the first day of burning) than that modeled for Alternative 5.

Sediment

Erosion increases following stand replacement fire, and salvage logging can further increase hillslope erosion and subsequent sedimentation of streams. Thus, the protection of water quality and fisheries was extremely important in deciding whether to salvage log and the methods and amounts of salvage, road work, and fuel treatments to apply.

Panther Creek is listed by Oregon Department of Environmental Quality as water quality limited because of high summer water temperatures. Sensitive fish species (steelhead, cutthroat, and coho salmon) occupy streams in the

planning area and downstream in the Wild and Scenic North Umpqua River. Though increases in water temperature have already occurred and will continue for many years until riparian areas grow back, none of various salvage proposals would worsen the trends in stream temperature. In fact, Alternatives 2, 3, 4, and 6 all take action to reforest burned riparian areas adjacent to salvage units to help improve the water quality situation in the future. The largest concern with the proposed action was sediment production from harvest, fuel burning, and road work.

A roads analysis was accomplished for the Panther Creek watershed which recommended the decommissioning and the reconstruction of several road segments in order to improve the transportation system and watershed conditions in the long-term. Unfortunately, the impacts of carrying out such road-related restoration in terms of short-term sediment production proved to be too much based on guidance provided by NOAA Fisheries during our planning process when NOAA Fisheries had regulatory authority under the Endangered Species Act. Any minimal level of road work would have caused the project to stall with a “likely to adversely affect” determination for the coho salmon, listed by NOAA as a threatened species until four months after the publication of the DEIS. Thus, I reluctantly opted to forgo any of the substantial road-related restorative opportunities as part of this salvage sale analysis. Instead, only those road segments posing problems to safe timber haul were considered—this equated to only two small reconstruction sites and routine levels of road maintenance that occurs via the timber sale contract.

Alternative 3 was developed to address the sediment issue, and it represents the most conservative approach of the action alternatives by not salvaging eight units totaling 103 acres where steep burned slopes present more risk of surface erosion and possibly mass wasting. Alternatives 2 and 4 contain all eight of these units while Alternative 5 includes five units (79.8 acres) and Alternative 6 includes three units (74 acres). Also in Alternative 3, underburning was changed to hand-pile burning within eleven harvest units totaling 212 acres to minimize losses of logging-created fuels and regenerating vegetation that both function to lessen surface erosion. Alternatives 2, 4, and 6 all apply underburning (broadcast) burning to these eleven units, contingent on the results of fuel inventories after harvest.

In the short term, Alternative 3 would exert less risk to aquatic resources from sedimentation associated with this project. The post harvest fuel inventories that will occur in the most sensitive harvest units will act to further lessen any risks to sedimentation and site productivity since the findings of the inventories may trigger changes to planned burned prescriptions based on availability of effective ground cover in the sensitive sites. Given the relatively minor differences in risk of sedimentation between Alternatives 3 and 6 (FEIS pages 227-229 and 241-246), I have chosen Alternative 6 in order to gain further economic returns, plant more acres, and lessen fuel loads on more acres.

Alternative 5 would use handpile burning almost exclusively, therefore removing less of the effective ground cover. This, in combination with the higher levels of dead tree retention also makes Alternative 5 a lower risk alternative in terms of stream sedimentation in the short term. I did not choose either Alternatives 1 or 5, because they result in too much risk of long-term sedimentation due to their higher levels of residual fuels potentially leading to larger, hotter fires and potentially more erosion and stream sedimentation in future years, if such fires occur.

Of the five salvage alternatives, Alternative 4 has the highest short-term risk to fish and water quality due to sediment production, because of its larger treatment acreage, higher level of temporary road construction, and acres of underburning. This, in large part, is why I did not choose Alternative 4.

Many comments were received during the DEIS comment period regarding the additional impacts of logging and fuels treatment following the impacts of the fire. Commenters pointed out that any additional impacts would not be consistent with the objectives of the Aquatic Conservation Strategy or the Clean Water Act. It was pointed out that there was not enough disclosure and analysis of the effects of logging and fuel burning in light of existing detrimental soil conditions that must be cumulatively assessed as required by Forest Plan standards. The FEIS provides more site-specific analysis and I have considered that in making my decision to select Alternative 6.

In selecting Alternative 6, I have chosen to focus the salvage only in the steep and dry landscape area and to forgo salvage in other landscape areas. This is in keeping with the landscape plan developed in the 2001 Middle North Umpqua watershed analysis designed to restore and maintain landscape patterns to approximate the natural disturbance regime. The landscape plan was developed to address the Aquatic Conservation Strategy which is based on natural disturbance processes (Northwest Forest Plan, ROD B-9).

I have considered the short-term risks of sedimentation to the aquatic environment of the streams within the 6th field planning area and to downstream environments of the 5th field watershed. I have reviewed the details of the affected aquatic environment in the FEIS, which thoroughly describes the existing physical and biological conditions of all aspects of the riparian and aquatic environment, and I have reviewed the direct, indirect, and cumulative effects of the alternatives. I have also reviewed the site-specific Best Management Practices (FEIS 54-64) designed as mitigation to help ameliorate erosion and pollution associated with logging, timber haul on roads, temporary road construction, and fuel burning and that are responsive to the Clean Water Act and Forest Plan standards and guidelines. These practices will be implemented and their effectiveness monitored by timber sale administrators and watershed personnel as the various timber sales under this decision are implemented. Though these mitigations will lessen impacts, some

short-term impacts to the aquatic environment will be realized as a result of Alternative 6, as disclosed in the analysis of direct effects found in the aquatic section of Chapter 3 of the FEIS beginning on page 286.

Though short-term impacts from erosion and sedimentation are expected within the 6th field watershed of Panther Creek, long-term impacts lasting more than a decade will not be realized at the scale of the Middle North Umpqua 5th field watershed. Alternative 6 was designed to contribute to the maintenance and restoration of landscape patterns based on the watershed analysis, and it meets all standards and guidelines in the Forest Plan, as amended by the Northwest Forest Plan.

In selecting Alternative 6, I will implement the best approach to capturing the economic value of the burned timber and reducing fuels while protecting water quality and fish habitat by limiting sedimentation. Alternative 6 is predicted to hold a future fire to the smallest acreage of the alternatives considered, it avoids salvage and fuel treatment in riparian reserves allowing natural recovery processes to operate, it plants using wide spacing within the riparian reserves adjacent to salvage units to speed shade and erosion recovery while allowing for future species and structural diversity, and it reduces fuels where it make the most ecological sense—in the steep/dry Landscape Areas established in the watershed analysis. I feel that Alternative 6 will result in the least long-term term risk to the aquatic environment of all the alternatives I considered in detail.

Economics

The economics of the alternatives were important considerations in my decision since forestry and forest products are very important to the local economy. In addition, if fuel reductions cannot be accomplished through economically viable salvage sales, there is no practical way to meet the long term need of reducing fuel levels after this fire.

Alternative 4 was developed to address the issue of economics, as some people were concerned that the heavy use of helicopter logging in the proposed action might result in low or no returns to the treasury, may not be economically feasible, and may not attract bidders to the salvage sales. Alternative 4 addressed these economic concerns by relying more on skyline logging systems than helicopter logging, lowering the level of leave trees within harvest units, adding a small area of riparian reserve salvage, and maximizing the roadside salvage of fire-killed hazard trees paralleling high use, open roads. And as I mentioned earlier, Alternative 4 in the DEIS also included salvage of dead timber on unsuitable soils (too shallow and rocky to plant), but I had to drop that out in the FEIS due to problems with Forest Plan consistency.

Alternative 4 would have achieved the best net present value, the highest return to the treasury, and the most benefit to the local economy, creating the most jobs. Yet, I did not select Alternative 4 because it does not address the issues of old-growth impacts, stand structural diversity, and sediment as well as Alternative 6.

I chose Alternative 6 because it is an economically efficient alternative. Alternative 6 has the best benefit /cost ratio of all the action alternatives. Alternative 6 is more efficient than Alternative 4 by some measures due to higher volume per acre cut (because it does not include expensive dead tree salvage within green units), lower amount of helicopter logging, and lower KV-funded sale area improvements. Alternative 6 also has the least chance of suffering deficit conditions due to the potential cumulative increases in log supply from other fire salvage projects entering the market at the same time (FEIS pages 295-297). It has the second highest net present value (NPV--discounted dollar benefits minus discounted dollar costs), after Alternative 4 and its NPV is close to that of Alternative 4 (\$9,204,127 vs. \$10,196,374).

Fuel loads

The most difficult issue to balance was the amount of burned area to salvage log to help lessen the risk of future reburns and realize economic benefits with the trade-offs of removing large dead wood in terms of its role in recovering soils, wildlife habitat, and reforestation.

Alternative 4 was developed to address the issue raised during scoping regarding the risk of not treating fuels in areas such as riparian reserves and areas of shallow rocky soils designated as unplantable. I identified Alternative 4 as my preferred Alternative in the DEIS, in part, because it did treat some of the “unsuitable” (unplantable acres) and it treated a conservative amount of acreage in the riparian reserve land allocation. Since much of the Apple Fire would not receive any fuels reduction due the riparian reserve and late successional reserve land allocations, I felt justified in taking a more preemptive approach to lessening future risks in the matrix land allocation and a small amount of the riparian reserve in the planning area. The riparian reserve and unsuitable soils salvage sparked much controversy among a number of constituents.

It was also pointed out that Alternative 4 did not address a 1990 Forest LRMP prescription requiring that salvage in unsuitable soils be designed to meet wildlife objectives. To address this oversight, and include the salvage on unsuitable soils, a Forest Plan amendment would have been needed, which would have require more time. Time is critical as wood value deteriorates rapidly following a fire. Thus, I opted to make changes to Alternatives 4 and 6 in the FEIS by dropping out the unsuitable areas. Commenters also highlighted the fact that Alternative 4 did not perform as well as some other action

alternatives at reducing the size of future fires. Substantial concern was expressed over the removal of large wood and the loss of ecological functions that large wood plays in the recovery of the future forest in harsh, unsuitable soils. Still more people argued that harvest in the riparian reserve land allocation was not warranted in light of the analysis presented in the DEIS.

I agree that the conservative amount of harvest in the riparian reserve land allocation in Alternative 4 would not likely make a measurable difference in the area or degree of fire effects at the landscape scale. Though the analysis in the aquatic section of the FEIS reveals no significant impacts to riparian conditions with this minor amount of activity, our analysis tools were not sensitive enough to specifically show how the riparian reserve would benefit from the selective harvest and fuels treatment there. As a result of this input, I decided against Alternative 4.

During the DEIS comment period, some people said that the reburn assumptions used in the analysis were exaggerated and unfounded, citing Beschta et al, 1995 that there is no evidence supporting the contention that leaving large dead trees significantly increased the probability of reburn.

Accumulations of large fuels will influence future fires and our ability to fight them. In fact, the length of time fire persists in a particular location, fire's resistance to control, and the time it takes to accomplish a burn-out are all significantly influenced by fuel loading. Accumulations of large-sized fuel such as fallen tree boles will burn much hotter and for a longer period of time, which impacts soil and affects erosion processes. Large fuel loads seriously hamper our ability to rapidly construct fire line and it diminishes our effective use of burn-out in front of a moving fire when a rapid burnout is critical. This all leads to the growth of fires.

Commenters from the other side of the argument felt that the proposal would do little to significantly reduce the threat of repeated future catastrophic fires, that late successional reserves should also be logged to reduce fuel loading, that adjacent lands will be put at greater risk due to a lack of action in much of the Apple Fire, and that subsequent fires will burn hotter and create resource damage of far greater long-term consequence than the Apple Fire.

I share these concerns, but I also know that fire occurs frequently on the steep dry landscapes of the Apple Fire relative to other locations on the Ranger District (FEIS p. 74-75). As such, our management of fuels can only go so far to lessen future fires and to accommodate future suppression efforts. We carried out a very aggressive salvage program following the 1987 Apple Fire with clear cuts, leaving little to no retention and included riparian areas in those clearcuts. The only retention of unsalvaged timber was the fire-killed stands in the visual corridor of the North Umpqua River. The 2002 Apple Fire killed the

regenerating forests within the clearcuts and within the unsalvaged areas, too. This previous salvage effort did not appear to substantially alleviate the effects of the 2002 Apple Fire.

In selecting Alternative 6, I considered the many discussions over the risks of future fires, the public concern and controversy surrounding salvage in riparian reserves and the benefits of such salvage as proposed in Alternative 4. I have concluded that Alternative 6, with its strategic fuel breaks, its use of a variety of leave prescriptions, and its focus on the steep/dry landscape area in the matrix land allocation is the best approach.

Low Road Density Areas

Although roadless designation is outside the scope of this project (it is decided at the Forest Plan or higher level), five conservation groups were concerned that the proposed project had the potential to impact the character of two areas they call uninventoried roadless areas, as they were not recognized as roadless areas in the 1990 Forest Plan. Such areas are referred to as low road density areas in the Middle North Umpqua Watershed Analysis. This issue, in part, drove the development of Alternative 5, which among other things, avoided harvest in the two areas mapped by Oregon Natural Resources Council. Alternative 1 would also result in no impacts to the character of these two areas.

During the DEIS comment period, more analysis was requested on the impacts of the logging on the area's future eligibility for wilderness designation. That analysis has been included in the FEIS (page 303), and I have considered it.

I considered Alternatives 1 and 5, but did not select either. My principal concern with these alternatives is that they did not meet the economic needs. In addition, both these alternatives leave large areas with high fuel loading, leaving too much risk of a future reburn. Alternative 6 will not build any permanent roads into either of the areas identified by ONRC and other groups as uninventoried roadless, but the salvage of 465 acres in these areas will interject noticeable management activities as tree stumps replace dead standing and down trees, affecting the visual character and lessening the potential for solitude.

I choose to salvage 465 acres of fire-killed stands in these areas in light of the fact that these particular low road density areas with their small size, narrow configurations, and their juxtaposition to the sights and sounds of a heavily managed landscapes, make them very unlikely candidates for either a roadless or wilderness designation to begin with (FEIS p. 300-303). Salvaging within these low road density areas is fully consistent with Forest Plan direction for the matrix land allocation, and this decision does not represent a difficult trade-off given the existing character of these areas.

Landbirds

Activity created fuel burning is often conducted during the moist spring months to minimize soil impacts, but burning in the spring time has impacts to nesting birds. Underburning will occur when fuel moistures are adequate to meet the objective and such fuel moistures are most likely to occur during the spring or fall months. This decision applies no restrictions on spring burning. Action Alternatives 3, 5, and 6 all respond to this issue by underburning fewer acres compared to the proposed action, and Alternative 1 responds by no burning at all. Though the level of underburning in Alternative 6 is higher than that of these other action alternatives that also address the issue, I feel that overall, Alternative 6 is better at balancing the whole suite of issues considered in the FEIS. Impact to landbirds, while important to minimize, was not the principal driver in either the design or the selection of an alternative; the direct impacts to young birds in terms of fire-caused mortality will be a one-time impact that is not predicted to have long-term effects to populations (FEIS pages 153-157)

Other issues were considered in the assessment of effects, but were not used as the basis for alternative development as they were resolved in other ways (FEIS, Chapter 2).

Cumulative Effects from Ongoing and Proposed Activities

In deciding to go forward with Alternative 6 of the Baked Apple Fire Salvage Project, I reviewed the other past, present, and proposed activities within the Panther Creek subwatershed (FEIS, p. 70-73). Of concern is how these actions may cumulatively affect water quality, fish habitat, and listed or sensitive species. During the analysis, I directed the IDT to consider the likely effects of past, present, and future activities in combination with the proposed activities of the Baked Apple Project including the recent fire suppression and fire rehabilitation activities. The thorough analysis of effects (FEIS, Chapter 3) did not indicate likely significant cumulative effects.

Consultation with USFWS and NOAA

A Biological Opinion was completed by the U.S. Fish and Wildlife Service on April 16, 2004 on Alternative 6 of the Baked Apple Fire Salvage project. The Biological Opinion covers the Northern Spotted Owl and the Northern Bald Eagle meeting all requirements under Section 7 of the Endangered Species Act.

Consultation with NOAA Fisheries on essential fish habitat for coho and Chinook salmon under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) is not warranted because a determination has been made that the project would not adversely affect essential fish habitat (FEIS p. 285). Oregon Coast coho salmon has been listed as a threatened species under the Endangered Species Act since August of 1998, but a court ruling in February, 2004 rendered this listing unlawful and unenforceable by NOAA Fisheries. NOAA Fisheries is now in the process of reassessing the status of the Oregon Coast coho.

Forest Plan Consistency

This Umpqua National Forest Land and Resource Management Plan and its amendments have been reviewed and a determination made that this decision is consistent with it. The 1990 Umpqua National Forest Land and Resource Management Plan, as amended, provided the framework for the development of all the alternatives. The actions in this project comply fully with the goals of the Forest Plan, as amended by the Northwest Forest Plan and its amendments, Management Area Direction (LRMP-IV-128 to 136), and Standards and Guidelines of the Umpqua National Forest Plan (Chapter IV of the LRMP) and Northwest Forest Plan for matrix (Attachment A pages C39-21) and riparian reserve land allocations (Attachment A pages C30-38).

Legal Requirements and Policy

In reviewing the EIS and actions involved in Alternative 6, I have concluded that my decision is consistent with the following laws and requirements:

The Preservation of American Antiquities Act, June 1906: All surveyed and inventoried cultural resource sites in the Baked Apple project area will be protected from entry and excluded from any resource management activities. New sites discovered during operations will be protected by provisions in the timber sale contract (C6.24) and the mitigation measures on page 63 of the FEIS.

The National Historic Preservation Act: The Oregon State Historic Preservation Officer (SHPO) has been consulted concerning proposed activities in the Baked Apple project area. A report documenting the inventory for this project has been submitted to the Oregon State Historic Preservation Office fulfilling the requirements of the 1995 Programmatic Agreement, No. 94-06-59-16, between the Advisory Council on Historic Resources, State Historic Preservation Officer, and Region 6 of the Forest Service. An appropriate inventory was conducted for this undertaking and properties which may be

eligible for inclusion in the National Register of Historic Places have been located. Avoidance measures will be implemented as per stipulations in the Programmatic Agreement.

The National Environmental Policy Act (NEPA), 1969: NEPA establishes the format and content requirements of environmental analysis and documentation, such as the Baked Apple Fire Salvage Project. The entire process of preparing an environmental impact statement was undertaken to comply with NEPA.

The Endangered Species Act of 1973, as amended: A biological assessment has been prepared to document possible effects of proposed activities on the threatened Northern Spotted Owl and Northern Bald Eagle. As documented above, appropriate coordination and consultation with USFWS has been completed.

The National Forest Management Act (NFMA), 1976: All alternatives were developed to be in full compliance with NFMA.

Clean Air Act Amendments, 1977: Alternative 6 is designed to meet the National Ambient Air Quality standards through avoidance of practices that degrade air quality below health and visibility standards. The Oregon State Implementation Plan and the Oregon State Smoke Management Plan will be followed to maintain air quality.

The Clean Water Act, 1982: Alternative 6 will meet and conform to the Clean Water Act as amended in 1982. This act establishes a non-degradation policy for all federally proposed projects. Alternative 6 meets anti-degradation standards agreed to by the State of Oregon and the Forest Service, Region 6, in a Memorandum of Understanding (Forest Service Manual 1561.5). This will be accomplished through planning, application, and monitoring of Best Management Practices (BMPs). Site-specific BMPs have been designed to protect beneficial uses.

Satisfaction of State Forest Worker Safety Codes: The Oregon Occupational Safety and Health Code for Forest Activities (OAR 437, Division 6) regulations will be met when Alternative 6 is implemented. Salvage strategies are designed to provide for worker safety by providing for appropriately sized openings to facilitate safe operation of yarding equipment or by clumping dead trees that are retained.

Other Policy or Guiding Documentation: A Biological Evaluation was prepared to assess potential effects to sensitive species as identified by the Regional Forester. This evaluation determined that while there may be impacts to individual sensitive species, those effects are not likely to contribute to a trend towards federal listing or loss of viability of the population or species.

Public Participation

The NEPA scoping process (40 CFR 1501.7) was used to invite public participation, to refine the scope of this project, and to identify preliminary issues to be addressed. The Forest Service sought information, comments, and assistance from Federal, State, and local agencies, the tribes, and other groups and individuals interested in or affected by the Proposed Action. The public was provided numerous opportunities to participate in the Baked Apple Fire Salvage Project.

The Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and the Cow Creek Band of Umpqua Tribe of Indians were contacted during the Apple and Tiller fires of 2002. While the above tribes were invited on a field trip, only the Cow Creek Band of the Umpqua Tribe of Indians was able to attend an October, 2002 site visit to inspect the burned area. Personal contacts were made with representatives of all three tribes once scoping began to be sure all three tribes receive enough desired information about the proposed salvage project. No concerns were expressed by the tribes. The Cow Creeks specifically said they support logging with minimal road construction.

The Environmentally Preferable Alternative

In this ROD, I have described the selected alternative and given rationale for its selection. It is also required by law that one or more environmentally preferable alternatives be disclosed. Based on regulations, the environmentally preferable alternative is not necessarily the alternative that will be implemented and it does not have to meet the underlying need for the project. It does, however, have to cause the least damage to the biological and physical environment and best protect, preserve, and enhance historical, cultural, and natural resources [Section 101 NEPA; 40 CFR 1505.2(b)].

In the case of the Baked Apple Fire Salvage Project, I have determined that Alternative 3 is the environmentally preferable alternative. Alternative 3 provides the lowest risk of additional watershed damage by dropping several steep units that were severely burned near the lower fish-bearing portions of Limpy Creek, uses more handpile burning than underburning to assume less erosion risk, and uses the ecologically derived leave tree process for leave prescriptions, while treating enough of the fuels to reasonably lessen the size of a future fire that could potentially lead to long-term effects to natural resources.

Alternative 1 is not environmentally preferable because it does not accelerate reforestation and it does not lower the risk of a future severe reburn. Alternative 5, like Alternative 1, is not environmentally preferable because it does little to accelerate reforestation and to lower the risk of a future reburn. Alternatives 2, 4, and 6 are not environmentally preferable because they take more short-term watershed risks by applying more broadcast burning, and harvesting more acres of severely burned units. Alternatives 2, 4, and 6 do hold a future fire to a smaller size, but not appreciable smaller than Alternative 3.

Mitigation Measures

Mitigation measures are site-specific management activities designed to reduce the adverse impacts of timber harvest and associated activities. These measures, added to the design features built into Alternative 6, represent a suite of practical means that will minimize environmental harm. Mitigation measures will be implemented through project design, contract specifications, contract administration, and monitoring by Forest Service officers.

As part of my decision, I am choosing to implement the mitigation measures identified in the EIS (FEIS, pp.54-64). I am confident that the selected mitigation measures will adequately lessen or prevent adverse effects for the following reasons: the selected mitigation measures are practices we have used successfully in the past; they are State-recognized Best Management Practices for protecting water quality; or they are based on current research (e.g., the snag management approach). I have decided to monitor the implementation of these measures and, in some instances, to monitor their effectiveness, as described in the following section.

Monitoring

Monitoring of the Apple Fire Salvage Project is designed to accomplish three purposes: 1) to assure that all aspects of the project are implemented as intended; 2) to determine, for certain critical activities, that the effects of the activities are consistent with the intent; and 3) to allow adaptation if it is found that activities are not being implemented correctly or are not having the desired effects. The monitoring elements, along with the mitigation measures and compliance with the timber sale contract represent the enforcement program for this decision. For example, if monitoring of logging operations by the sale administrator, soil scientist, or silviculturist finds that standards and guidelines, best management practices, mitigating measures, or the silvicultural prescription are not being met, additional measures will be prescribed to insure compliance.

The following monitoring items described in pages 54-64 of the FEIS are a part of my decision. They are listed in order of priority. Those required by law or the Forest Plan are mandatory under this decision, while those funded by trust funds or other methods are discretionary as funding or staffing allows:

Elements required by law or as a Forest Plan Standard:

✓ Inventories will be conducted before fuels treatments in salvage units totaling an estimated 500 acres where ground cover was less than 85% EGC after the fire, in areas of severe regeneration limitations, and in areas of severe burn effects in order to determine if slash treatment is needed and/or severe burn effects to determine if there is a need to mitigate EGC with seeding or straw mulch. In these areas, no slash treatment using fire will occur if post-harvest EGC in the form of logging slash is less than 85% and fuel loading is less than 25 tons per acre. Where post-fire fuel loads exceed 25 tons per acre, slash treatment will primarily consist of 'lop and scatter' treatments. Limited hand pile and/or jackpot burning may occur in large fuel concentrations.

✓ Ground cover following broadcast burning will be monitored to determine if an effective ground cover (EGC) of 85% exists following the fuels reduction treatments. The application of weed-free straw or seeding with native species, as available, would be required if fuel treatment reduces EGC below 85% (meets soils S&G #11, LRMP IV-71).

✓ Logging operations will be monitored by the sale administrator, soil scientist, or silviculturist. If standards and guidelines, best management practices, mitigating measures, or the silvicultural prescription are not being met, additional measures will be prescribed to insure compliance (Federal Clean Water Act).

✓ Burning will be conducted to meet air quality standards as outlined by Oregon DEQ, and air quality monitoring will be conducted in conjunction with the DEQ (Federal Clean Air Act).

Element paid for by timber sale trust funds—KV and BD funds:

✓ After harvest, use KV funding to monitor and treat remaining or new infestations of noxious weed for up to five years following sale closure.

✓ Regeneration harvest units located in capable, available, and suitable lands should be examined the 1st, 3rd, and 5th growing seasons after planting or until reforestation is certified complete with a minimum of 125 trees per acre.

✓ Post-harvest fuel surveys will be conducted on representative harvest units to determine if fuel disposal prescriptions need to be modified to meet objectives for fuel reduction or soil protection.

Elements to monitor as staffing and funding allows:

- ✓ Monitor the live tree mortality and bark beetle populations in monitoring plots established in the winter of 2003 with the Oregon Insect and Disease technical Center.
- ✓ The silviculturist will review marking guides with the presale crew prior to marking and monitor quality both during and after the unit is completely marked, on a sample of each type of prescription. If the number of leave trees per acre exceeds plus or minus 10 percent of the target, remarking or amending the silvicultural prescription will be necessary.
- ✓ Continue water quality monitoring for DO, pH, temperature and turbidity in the Panther Creek subwatershed as funding and staffing allows.
- ✓ Continue landbird monitoring on the forest to monitor local landbird population trends.
- ✓ The interdisciplinary team or District staff will monitor attainment of project objectives following salvage/fuel treatment through a review of at least one timber sale in the Baked Apple Salvage EIS. Key elements of adaptive management will be tracked and implemented in future planning efforts.

Consistency with NFMA Requirements

In all other respects, I find this decision to be consistent with the Umpqua Forest Plan and with the requirements of the National Forest Management Act implementing regulations; specifically:

Silvicultural Practices

Alternative 6 includes no timber salvage on lands classified as not suited for timber production during forest planning (36 CFR 219.27(c)(1)).

Even-aged Management/Clearcutting

Alternative 6 includes reforestation and salvage of timber killed by a catastrophic wildfire. According to the requirements of 36 CFR 219.27(d) and 16 USC 1604(k), the limits on opening size do not apply because the opening is a result of catastrophic conditions. The reforestation of the openings will result in even-aged stands where the fire killed all the live trees.

Vegetative Manipulation/Management Requirements

The selected action is consistent with the seven management requirements from 36 CFR 219.27 and the vegetation requirements from 36 CFR 219.27(b).

Maintaining Viable Populations of Fish and Wildlife Species

The selected action is consistent with the viable population requirements of 36 CFR 219.19.

Implementation

I have reviewed the Apple Fire Salvage Project FEIS, and its associated appendices. I feel there is adequate information within these documents to provide a reasoned choice of action. I am fully aware of the possible adverse environmental effects that cannot be avoided, and the irreversible or irretrievable commitment of resources associated with Alternative 6. I have determined that these risks will be outweighed by the likely benefits (FEIS, Chapter 3). Implementing Alternative 6 will cause no unacceptable cumulative impact to any resource. There will be no significant impact to cultural resources, consumers, civil rights, minority groups, environmental justice, or women. There are no unusual energy requirements for implementing Alternative 6.

Implementation may occur on, but not before the 15th business day following the date of appeal disposition. In the event of multiple appeals, the implementation date will be established following the last appeal deposition (36 CFR 215.9(b)). If no appeal is filed, implementation may begin on, but not before, the 5th business day following the close of the appeal filing period (36 CFR 215.9(a)).

Procedure for Changes during Implementation:

Minor changes may be needed during implementation to better meet on-site resource management and protection objectives.

In determining whether and what kind of further NEPA action is required, I will consider the criteria for whether to supplement an existing Environmental Impact Statement in 40 CFR 1502.9(c) and FSH 1909.15, sec. 18, and in particular, whether the proposed change is a substantial change to the intent of the selected alternative as planned and already approved, and whether the change is relevant to environmental concerns. Connected or interrelated proposed changes regarding particular areas or specific activities will be considered together in making this determination. The cumulative impacts of these changes will also be considered.

The intent of field verification prior to my decision was to confirm inventory data and to determine the feasibility and general design and location of a road or unit, not to locate the final boundaries or road locations. For example, salvage unit prescriptions may be modified if site conditions dictate and if other resource objectives can be met. Minor adjustments to unit boundaries

may be needed during final layout for resource protection, to improve logging system efficiency, and to better meet the intent of my decision. Many of these minor changes will not present sufficient potential impacts to require any specific documentation or action to comply with applicable laws.

Appeal Rights

My decision is subject to administrative appeal (CFR 215.11). Organizations or members of the general public may appeal my decision according to 36 CFR Part 215. The 45-day appeal period begins the day following publication of this decision in the Roseburg News Review, the newspaper of record. The Notice of Appeal must be filed with the Appeal Deciding Officer:

James A. Caplan
Forest Supervisor, Umpqua National Forest
Attn. 1570 Appeals
2900 NW Stewart Parkway
Roseburg, OR 97470
Business Hours: 7:45am-4:30pm
Fax: 541-957-3495
Email: appeals-pacificnorthwest-umpqua@fs.fed.us

It is the responsibility of those who appeal a decision to provide the Forest Supervisor sufficient written evidence and rationale to show why my decision should be changed or reversed. Only those individuals or organizations who submitted substantive comments during the comment period (36 CFR 215.13), may appeal under 36 CFR 215.6. The appeal must be filed with the Appeal Deciding Officer in writing. At a minimum, an appeal must include the following (36 CFR 215.14):

1. Appellant's name and address, with a telephone number, if available;
2. Signature or other verification of authorship upon request (a scanned signature for electronic mail may be filed with the appeal);
3. When multiple names are listed on an appeal, identification of the lead appellant and verification of the identity of the lead appellant upon request;
4. The name of the project or activity for which the decision was made, the name and title of the Responsible Official, and the date of the decision;
5. Any specific change(s) in the decision that the appellant seeks and rationale for those changes;
6. Any portion(s) of the decision with which the appellant disagrees, and explanation for the disagreement;
7. Why the appellant believes the Responsible Official's decision failed to consider the substantive comments and;
8. How the appellant believes the decision specifically violates law, regulation, or policy.

Contact Person

For additional information concerning the specific activities authorized with my decision, you may contact:

Debbie Anderson,
Baked Apple Interdisciplinary Team Leader /
Umpqua National Forest Environmental Coordinator
2900 NW Stewart Parkway
Roseburg, OR. 97470
541-957-3466, Business Hours: 7:45am-4:30pm
Fax: 541-957-3495
Email: danderson01@fs.fed.us

Carol Cushing
District Ranger, North Umpqua Ranger District

Date Signed

Date Published



United States
Department of
Agriculture

Pacific
Northwest
Region

Forest
Service

April 2004

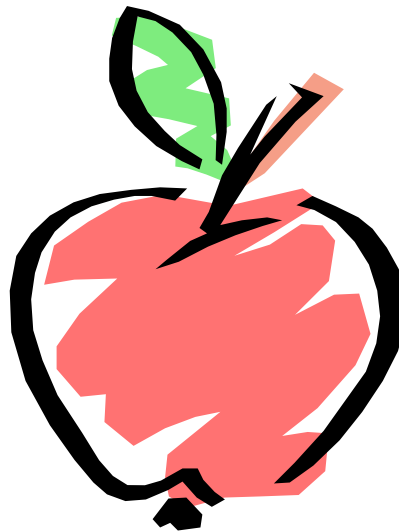


Baked Apple Fire Salvage

FINAL ENVIRONMENTAL IMPACT STATEMENT

NORTH UMPQUA RANGER DISTRICT

UMPQUA NATIONAL FOREST



BAKED APPLE FIRE SALVAGE PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT

Douglas County, Oregon
April 2004

Lead Agency: USDA Forest Service, Umpqua National Forest

Responsible Official: Carol Cushing, District Ranger
North Umpqua Ranger District

For More Information Contact: Debbie Anderson, Team Leader
Umpqua National Forest
2900 NW Stewart Parkway
Roseburg, OR 97470
Phone: 541-957-3466

Appeal Information:

Abstract: This Final Environmental Impact Statement (FEIS) documents alternatives considered for timber salvage and fuels reduction within the Matrix land allocation of the 2002 Apple Fire area on the Umpqua National Forest, North Umpqua Ranger District. The purpose of and need for action includes the need to recover the economic value of the burned wood before it decays and to reduce existing and created fuels within the planning area. Mitigation measures and management requirements for fish, water, plants, soil and cultural resources are also considered. Six alternatives are considered, including: Alternative 1, no action; Alternative 2, the proposed action, which was designed to capture the economic value of the fire-killed trees and reduce fuels loads, while meeting Forest Plan Standards and Guidelines; Alternative 3, which was designed to further minimize risk to aquatic ecosystems; Alternative 4, which was designed to maximize economic recovery and economic returns and further reduce fuel loads; Alternative 5, which follows the guidance of the "Beschta" prescription; and Alternative 6, which blends together portions of issues developed during scoping. The Forest Service has identified Alternative 6 as the preferred alternative.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

CONTENTS.....	PAGE
SUMMARY	Summary - 1
Introduction - Chapter 1	1
Changes Between Draft and Final	1
The 2002 Apple Fire	1
Apple Fire Suppression and Rehabilitation.....	3
Planning Area Overview.....	5
Purpose Of And Need For Action	8
Proposed Action	9
Decisions To Be Made Based On This Analysis	10
Relationship To Forest Plans, Roads Analysis, The Project Record, And The Middle North Umpqua Watershed Analysis.....	11
Scoping	14
Issues.....	14
Issues That Did Not Drive Alternatives	16
Non-Significant Issues	17
Introduction - Chapter 2	19
Changes Between Draft and Final	19
Alternatives Considered, But Eliminated From Detailed Study.....	19
Alternatives Considered In Detail	21
Alternative 1	21
Alternative 2.....	23
Alternative 3.....	29
Alternative 4.....	35
Alternative 5.....	43
Alternative 6.....	48
Best Management Practices, Management Requirements, Mitigation Measures, And Monitoring	54
Summary And Comparison of Alternatives	65
Introduction - Chapter 3	69
Changes Between Draft and Final	69
Activities That Contribute To Cumulative Effects.	70
Terrestrial Environment	73
Fire And Fuels	73
Fuel Loadings - Tracked As A Significant Issue	79
Fire Effects/Fire Behavior	107
Terrestrial Wildlife Habitats	110
Aquatic Conservation Strategy - Terrestrial Components	111
Early-Successional Habitat With Snags - Tracked As A Significant Issue	112
Late-Successional Habitat - Tracked As A Significant Issue	116
Coarse Woody Debris - Tracked As A Significant Issue	120
Effects On Sensitive Wildlife Species	129
Big Game	146
Species Previously Known as Survey & Manage, Protection & Buffer Species.....	148
Landbirds.....	151
Management Indicator Species	157
Soils In The Project Area	159
Unsuitable Soils	162

	PAGE
Burn Severity	164
Soil Productivity.....	165
Effective Ground Cover	169
Nutrients	171
Coarse Woody Debris	173
Detrimental Soil Conditions	175
Soil Biology and Mycorrhizae.....	178
Carbon Cycle/Carbon Sequestration.....	179
Threatened, Endangered and Sensitive (TES) Plants.....	180
Species Previously Known as Survey and Manage Plants and Fungi.....	183
Noxious Weeds	183
Insects	186
Deterioration of Fire Killed Trees	189
Vegetative Regrowth and Forest Succession	191
Aquatic Environment	196
The North Umpqua River	196
Beneficial Uses of Water.....	198
Water Quality.....	198
Stream Temperature	198
Water Chemistry	205
Peak Flows	214
Erosion and Sedimentation - Tracked as a Significant Issue	220
Mass Wasting.....	221
Fluvial Erosion.....	232
Surface Erosion.....	238
Road-Related Erosion and Sedimentation.....	248
Road Reconstruction Sites.....	252
Road Prism Surfaces	254
Timber Sale Road Maintenance	255
Timber Haul.....	257
Watershed Conditions And Fish Distribution.....	260
Stream Habitats	269
Stream Substrate.....	270
Large Woody Material	272
Pool Character	272
Low Velocity Refuge Habitat.....	273
Refugia	274
Channel Condition and Dynamics.....	275
Habitat Access.....	277
Biological Evaluation for Fish and Aquatic Species	281
Social Environment	287
Economics - Tracked as a Significant Issue	287
Recreation	297
Hunting	297
Vehicular Access	298
Visuals	299
Low Road Density Areas - Tracked as a Significant Issue	300
Air Quality.....	303

	PAGE
Unavoidable Adverse Impacts.....	307
Irreversible and Irretrievable Commitments of Resources	308
Short Term and Long Term Productivity	308
Specifically Required Disclosures.....	309
Public and Worker Safety	309
Cultural Resources	311
Unique Habitats	312
Wetlands and Floodplains	312
Prime Farmlands, Rangelands, forestlands or Parklands	312
Potential or Unusual Expenditures of Energy.....	312
Conflicts with Plans or Policies of Other Jurisdictions.....	312
Consumers, Civil Rights, Minority Groups, and Women.....	312
Environmental Justice	315
Introduction - Chapter 4	315
Baked Apple Interdisciplinary Team	315
Other Contributors and Reviewers	317
Introduction - Chapter 5	315
Baked Apple Public Involvement Process	319
Tribes That Were Consulted.....	320
List of Persons and Agencies who Participated in the Planning Process Either at Open Houses, Public Forums, Meetings, Field Trips or Who Wrote Letters of Input	320
Distribution of The Draft and Final EIS	320
Response to Comments	325
List of Tables	PAGE

Table A. Acres Burned Within the 2002 Apple Fire by Land Allocation	2
Table B. Acres of Late Seral Forest Burned Within the N. Umpqua Watershed by Land Allocation	5
Table 1. Alternative 2 Salvage Units	26
Table 2. Alternative 3 Salvage Units	32
Table 3. Alternative 4 Salvage Units	39
Table 4. Alternative 5 Salvage Units	46
Table 5. Alternative 6 Salvage Units	52
Table 6. Differences Between the Alternatives	65
Table 7. Comparison of Alternatives	66
Table 8. Past Management Activities in the Panther Creek Subwatershed	70
Table 9. Fire Suppression and Burned Area Emergency Response (BAER) Activities for the 2002 Apple-Fire and Present	72
Table 10. Reasonably Foreseeable Actions in the Planning Area	73
Table 11. BTU/ft ² Produced by Fuel Model (90th Percentile Weather)	80
Table 12. Resistance to Control Ratings by Fuel Loading (tons/acre)	84
Table 13. Alternative1: Potential Fuel Accumulations (tons/acre) and Remaining Snags/acre.....	86
Table 14. Fire Behavior Associated with the 3 Variations of Fuel Model 11	87
Table 15. Fire Behavior Associated with the 3 Variations of Fuel Model 12	89
Table 16. Average Residual Fuel Tonnage for Alternative 2	93

	PAGE
Table 17. Alternative 2: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre	94
Table 18. Average Residual Fuel Tonnage for Alternative3	96
Table 19. Alternative 3: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre	97
Table 20. Average Residual Tonnage for Alternative 4.....	98
Table 21. Alternative 4: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre	98
Table 22. Average Residual Tonnage for Alternative 5.....	100
Table 23. Alternative 5: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre	101
Table 23A. Comparison of 10-100 Hour Fuel Accumulations (Post Salvage) between Benchmark and Baked Apple Salvage	101
Table 24. Average Residual Tonnage for Alternative 6.....	103
Table 25. Alternative 6: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre	103
Table 26. Comparison of Alternatives Using Fire and Fuel Parameters	108
Table 27. Desired Condition of Decayed Snags and Logs in 100 Years by Forest Plant Association Group (PAG)	121
Table 28. Forest Plan Snag Requirements and Current Levels	122
Table 29. Pre-field Review and Biological Evaluation Summary	130
Table 30. Provincial and Local Population Trends, for Landbird Focal Species	153
Table 31. Determination of Effects to Threatened, Endangered, and Sensitive Wildlife Species.....	158
Table 32. Summary of Soil Landtype Characteristics Within Alternative 2 Proposed Salvage Units.....	159
Table 33. Erosion Hazard Distribution for the Proposed Action and Alternatives.....	161
Table 34. Sensitive Soils in the Planning Area	162
Table 34A. Burn Severity in the Planning Area and by Alternative.....	165
Table 34B. Existing Ground Cover and Post Harvest EGC Predictions in Units	170
Table 35. Estimated Detrimental Soils Conditions due to Compaction and Displacement Within the Salvage Units	176
Table 36. Sensitive Plant Species for the Umpqua National Forest	180
Table 37. Noxious Weed Species Found in the Planning Area	184
Table 38. Acres of Tracked Noxious Weed Species By Alternative	185
Table 39. Douglas-fir Percent Sound Board Foot Volume	190
Table 40. Total Harvest Acres Planted and Percent of Harvest Area Planted by Alternative	194
Table 41. Total Acres of Management Activities That Would Lead to Vegetative Regrowth and Forest Succession	195
Table 42. Stream Temperature Data During the Warmest Seven-Day Periods of 1999-2001	199
Table 43. Riparian Reserve Conditions, Past and Present	200
Table 44. Effective Shade Distances for Tree Diameter Classes Slated for Riparian Treatment Under Alternative 4	203
Table 45. Alternative 4 Fuels Treatment within the Riparian Reserves of Class III Streams	204

	PAGE
Table 46. Summary of USGS Water Quality Sampling From 1995 and Post-Fire Sampling in 2003	207
Table 47. Estimated Dust Abatement Applications by Road Segment for the Baked Apple Action Alternatives	208
Table 48. Hydrologic Recovery Following Previous Timber Harvest and Prior to the 2002 Apple Fire	215
Table 49. Susceptibility to Peak Flow Increases and Elevated Hydrologic Risk Due To Reduction Of Canopy Closure (<70%) due to the Apple Fire	217
Table 50. Estimated Channel Extension from Ditch lines in the Baked Apple Planning Area	218
Table 51. Landslides Identified by Aerial Photo Interpretation Within the Baked Apple Planning Area (from the 2001 Middle North Umpqua Watershed Analysis	222
Table 52. Planning Area Acreage by SHALSTAB Risk Category	225
Table 53. Acres of Salvage by Alternative Proposed for Harvest Within Areas Mapped by the SHALSTAB Model 'At Maximum Risk' For Rapid-Shallow Land Sliding	228
Table 54. Large Wood Recruitment Due to BAER Projects and Future Recruitment Potential From Burned Late-Seral Riparian Areas	236
Table 55. Levels of Effective Ground Cover (EGC) by Alternative	242
Table 56. Timber Sale Road Maintenance Activities by Alternative	255
Table 57. Drainage Areas that Experienced Stand Replacing Fire in 2002	267
Table 58. Environmental Baseline and Effects of the Baked Apple Action Alternatives on NOAA Indicators at the Scale of the Panther Creek 6th Field Sub-Watershed	279
Table 59. Environmental Baseline and Effects of the Baked Apple Action Alternatives on NOAA Indicators at the Scale of the Middle North Umpqua 5th Field Sub-watershed	280
Table 60. Effects Determination for PETS Aquatic Species	284
Table 61. Ranking the Risk Associated With Each Alternative Within the Range of the Effects Determination	285
Table 62. Douglas County Economic Sectors	288
Table 63. Forest Service Planning Costs	289
Table 64. Economic Efficiency Analysis	290
Table 65. Effect of Log Price Decline on NPV	291
Table 66. Economic Impact Analysis	293
Table 67. Primary Sectors for Job Creation	294
Table 68. Average Log Prices	296
Table 69. Pounds of Emissions Produced Per Ton of Fuel Consumed	305
Table 70. Smoke Management Options	305
Table 71. Acres of Treatment and Predicted Emissions for Each Alternative	307
Table 72. Comments Received on the DEIS, by Subject of Concern, and the Forest Service's Response	328

List of Figures	PAGE
Figure 1. High Intensity Fire Area, 2002 Apple Fire.....	1
Figure 2. Planning Area Overview	7
Figure 3. Example of Salvaged Trees.....	8
Figure 4. Landscape Areas in the Middle North Umpqua.....	13
Figure 5. No Action - Alternative 1	22
Figure 6. Alternative 2 - Proposed Salvage Units.....	24
Figure 7. Alternative 3 - Proposed Salvage Units.....	30
Figure 8. Fuels Treatment for Class I and II Streams	36
Figure 9. Fuels Treatment for Class II and III Streams.....	36
Figure 10. Alternative 4 - Proposed Salvage Units	37
Figure 11. Alternative 5 - Proposed Salvage Units	44
Figure 12. Alternative 6 - Proposed Salvage Units	50
Figure 13. Fires Per Decade in the Baked Apple Planning Area.....	74
Figure 14. Fuel Model 5	76
Figure 15. Fuel Model 10	76
Figure 16. Umpqua National Forest Fire Regimes and 2002 Fire Perimeters	78
Figure 17. Snag Fall That Has Occurred in the Seven Years Since the 1996 Spring Fire	80
Figure 18. Snag Fall That Has Occurred in the Seven Years Since the 1996 Spring Fire	80
Figure 19. Baked Apple Unit 89, Fuel Consumption	81
Figure 20. Baked Apple Unit 15, Fire Effects	81
Figure 21. Baked Apple Unit 37, Fire Effects	81
Figure 22. The 2002 Apple Fire Smoke Column.....	82
Figure 23. Fire Regimes in the Apple Area	83
Figure 24. Fuel Model 8 in an Unburned Stand	85
Figure 25. Fuel Model 11	87
Figure 26. Fuel Model 12	88
Figure 27. Calibration of FARSITE Model, with Logical Human Caused Ignition Point..	90
Figure 28. FARSITE Prediction for Alternative 1.....	91
Figure 29. Predicted FARSITE Acres of Fire Spread in 25 Years.....	92
Figure 30. FARSITE Prediction for Alternative 2.....	95
Figure 31. FARSITE Prediction for Alternative 3.....	97
Figure 32. FARSITE Prediction for Alternative 4.....	99
Figure 33. FARSITE Prediction for Alternative 5.....	102
Figure 34. FARSITE Prediction for Alternative 6.....	105
Figure 35. Fuel Models in the Middle North Umpqua Watershed	106
Figure 36. Habitat Conditions in the Planning Area	111
Figure 37. Comparison of Alternatives Direct Impacts to Early-Successional Habitat.	114
Figure 38. Comparison of Alternative Impacts to Early-Successional Habitat Based on Acres Being Planted With Conifer	114
Figure 39. Comparison of Cumulative Impacts to Early-Successional Habitat and Related Wildlife Species	115
Figure 40. Comparison of Alternative Impacts to Late-Successional Habitat.....	117
Figure 41. Proposed Salvage Units in Relationship to Late-Successional Forest by Alternative Within the Planning Area	119
Figure 42. Cumulative Effects to Late-Successional Habitat Within the Larger Middle North Umpqua River Watershed.....	120

	PAGE
Figure 43. Comparison of Leave Tree (Snags) Retention by Alternative	123
Figure 44. Comparison of Mean Snag Levels for the Planning Area	126
Figure 45. Example of the Spatial Distribution of Dead Tree Patches Which Would be Salvaged by Alternative	125
Figure 46. Post-Fire Changes in Percent Ground Coverage of Down Wood From the Snag and Log Inventory	126
Figure 47. Mean Decay Class 4-5 Snag and Log Levels for Two Main Plant Association Groups	128
Figure 48. Comparison of Landscape Levels of High Density (snag/acre) Dead Tree Patches/Habitat Left in the Planning Area.....	128
Figure 49. Comparison of Potential Noise Disturbance Effects Caused by Timber Harvesting and Related Activities	133
Figure 50. Comparison of Potential Future Habitat Loss and Cumulative Effects From Future Fire as Modeled by FARSITE.....	134
Figure 51. Comparison of Percent Area with dead tree patches (unsalvaged fire-killed forest stands) Within the Falcon Management Zones	139
Figure 52. Comparison of Direct Effects From Burning in Riparian Habitats to Reduce Fuels	145
Figure 53. Comparison of Direct Impacts to the Orange-Crowned Warbler.....	156
Figure 54. Erosion Hazard for the Planning Area.....	161
Figure 55. Unsuitable Soils within the Baked Apple Planning Area.....	163
Figure 56. 2002 Apple Fire Soil Burn Severity Map.....	164
Figure 56A. Example of Salvage Areas with Severe Fire Effects and Regeneration Limitations	168
Figure 56B. Fuel Treatment Prescriptions by Alternative	170
Figure 56C. Severe Burn Effects and Regeneration Limitations by Alternative	172
Figure 56D. Average Leave Trees per acre on Poor Sites	174
Figure 57. Riparian Width Contributing Shade Based on Tree Height and 50% hillslope.....	202
Figure 58. The Effective Shade Zone.....	202
Figure 59. Clearcut Harvest within the Planning Area by Decade.....	215
Figure 60. Baked Apple Planning Area Susceptibility to Peak Flow Increases and Elevated Hydrologic Risk	216
Figure 61. The Debris Flow Process	221
Figure 62. Period of Diminished Tree Root Reinforcement Following Timber Harvest After Severe Wildfire	224
Figure 63. SHALSTAB Map Used to Predict the Occurrence of Shallow-Rapid Landslides	226
Figure 64. Channels Treated with the Addition of Large Wood During Post-Fire Burned Area Emergency Response (BAER) Efforts.....	234
Figure 65. Riparian Areas of Late-Successional Forest That Experienced Stand Replacement Fire that are Expected to Provide Recruitment into the Mainstem	235
Figure 66. Estimates of Tons of Sediment from Surface Erosion for 2001 Through 2006.....	244
Figure 67. Fish Distribution in the Portion of the Middle North Umpqua 5th Field Watershed Managed by the Forest Service.....	261
Figure 68. NPV & Return to Treasury	291
Figure 69. Logging Cost vs. B/C	292

	PAGE
Figure 70. Jobs Created by Alternative	294
Figure 71. Average Delivered Log Prices	296
 REFERENCES	 References - 1
GLOSSARY	Glossary - 1
INDEX.....	Index - 1
APPENDIX AA - Letters from governments, etc	Appendix AA - 1
APPENDICES - available on-line, via CD, or by request (for paper copy).	
Middle North Umpqua Watershed Analysis Recommendations	
That Apply to the Baked Apple Fire Salvage	Appendix - A
Best Management Practices Checklist.....	Appendix - B
Issues Relating to Beschta et. al. 1995	Appendix - C
Terrestrial Specialists Reports.....	Appendix - D
Aquatic Specialists Reports.....	Appendix - E
Social Specialists Reports	Appendix - F

DOCUMENT ORGANIZATION

Chapter 1 describes the “purpose and need” for action, identifies the project area, summarizes the proposed action, lists public issues surrounding the proposed action and discusses other considerations.

Chapter 2 presents and compares the alternatives, including the no-action alternative, and mitigation and monitoring measures.

Chapter 3 describes the environment that could be affected by each alternative and the direct, indirect, and cumulative effects likely to occur with implementation.

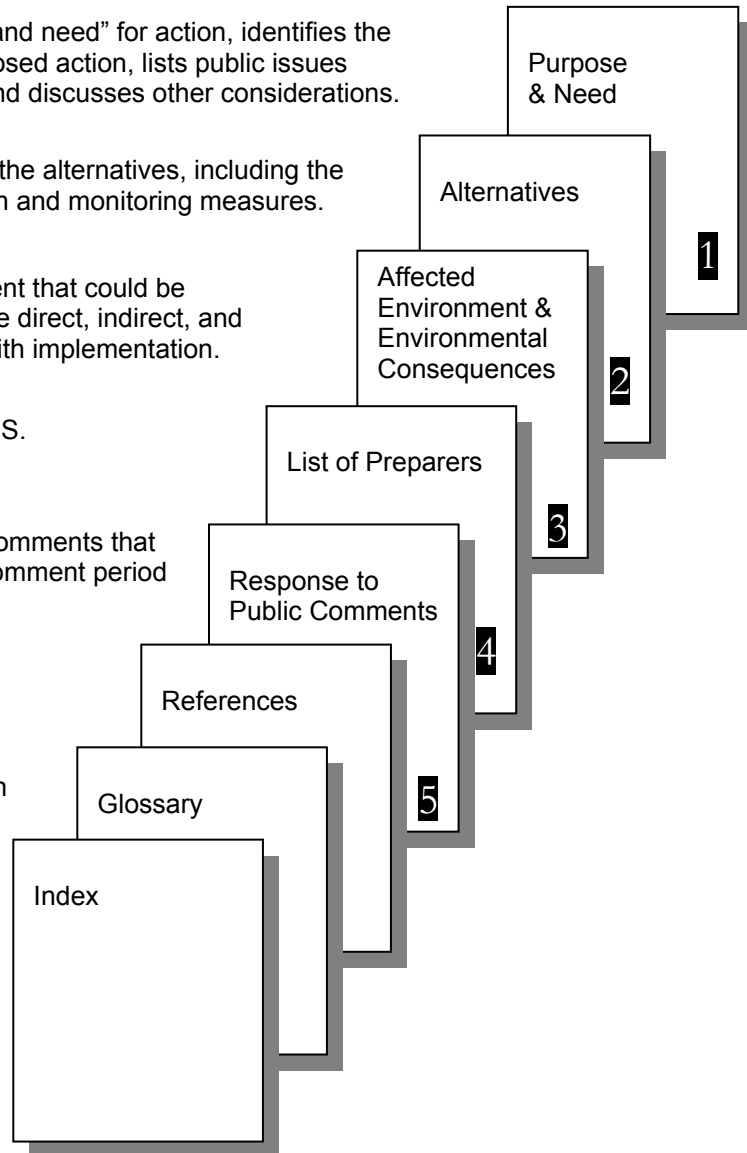
Chapter 4 lists preparers of the FEIS.

Chapter 5 responds to the public comments that were received during the 45-day comment period on the Draft EIS.

The Reference section lists the literature cited in the FEIS.

The Glossary defines terms used in the FEIS.

The Index provides page number references for key topics discussed in the FEIS.



This page intentionally left blank.

CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

Chapter 1 describes the purpose and need for action and the proposed action for the Baked Apple Fire Salvage Project. The chapter also identifies the project area, outlines applicable management direction, addresses the scope of the decision, summarizes the scoping process, and lists the issues identified during scoping. This chapter also highlights the changes made between the Draft and Final EIS.

This analysis is tiered to the Final Environmental Impact Statement (FEIS) for the 1990 Umpqua National Forest Land and Resource Management Plan (LRMP), as amended by the 1994 Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan) and its amendments. This analysis also incorporates by reference the Middle North Umpqua Watershed Analysis (WA) (USDA 2001) and the Wildfire Effects Evaluation Project (USDA 2003) and the Burned Area Emergency Response Report (2002).

CHANGES BETWEEN DRAFT AND FINAL

The FEIS contains a number of refinements and clarifications based on comments received during the 45-day comment period, and as a result of other changes in the Region (changes to the Aquatic Conservation Strategy (ACS), Survey and Manage Species, and a status change of the coho salmon from Threatened to Sensitive). Each chapter documents the changes that occurred between draft and final. For Chapter 1, commenters requested further information on total acres burned by the Apple Fire that would not be salvaged, information on other fires in the Middle North Umpqua watershed that occurred in 2002, additional information on the beneficial effects (financial) of the underburning that affected the lands in the planning area, and additional information on how the proposed action was developed.

THE 2002 APPLE FIRE

The Apple Fire, which started on August 16, 2002, burned almost 17,900 acres of early, mid, and late seral forests on the North Umpqua Ranger District. The human-caused fire burned in steep terrain during “explosive” conditions, as temperatures soared into the 90’s, the relative humidity dropped into the teens,



Figure 1. High Intensity Fire Area, 2002 Apple Fire

with winds over 10 miles per hour. Burning conditions were considered extreme. Resources, including hand crews, engines, and helicopters, were quickly mobilized, but could not halt the spread of the fire that continued to torch trees and burn through tree canopies. Spot fires were being reported over a mile away from the main fire. The Dry Creek Community, located four miles to the East, was alerted and structure protection measures were put in place. Nearby campgrounds were evacuated, the Calf Segment of the North Umpqua River was closed to hikers, while the North Umpqua River was closed to rafters. After 14 hours, over 2,300 acres had burned. Additional personnel were ordered, including an Incident Management Team, who would take over management of the fire, as Forest resources were being stretched thin. The fire continued to actively burn, and by the end of the second day, a total of 5,100 acres had been scorched. The fire burned the hottest in Limpy Creek, where large swaths of forest over a 4,000 acre area were burned (Figure 1). Firefighting resources continued to arrive and fire camp was established on private land in Glide, Oregon. Over the next few weeks, over 1,200 people were mobilized to fight the fire. By the time the fire was contained (control lines surrounded the fire, preventing its further spread) in September 2002, the fire had burned with high intensity¹ over 5,460 acres, burned with a mosaic pattern on almost 1,890 acres, and underburned over 9,560 acres (roads and natural openings are not included in acreage totals) as shown in Table A. Suppression costs for the Apple Fire totaled over \$16,500,000.

Table A. Acres burned within the 2002 Apple Fire by land allocation.

Seral Stage/Burn Intensity	Acres Burned in Planning Area (Matrix Only)	Acres Burned in Planning Area in Matrix Land minus the Riparian Reserves and Unsuitable Soils	Acres Burned by 2002 Apple Fire (Matrix and LSR Total, with riparian and unsuitable soils)
Stand Replaced Late Seral (Burned and Scorched)	2066	1200	2947
Underburned Mid/Late Seral	3718	2300	9566
Stand Replaced (Older Plantation)	991	655	1250
Stand Replaced (Younger Plantation)	968	648	1259
Mosaic Burned (Plantation)	950	544	1163
Underburned (Plantation)	513	328	726
Hardwoods/Natural Openings	146	110	395
Roads	456	315	568
TOTAL	9,808	6,100	17,874

Table A shows that the 2002 Apple Fire burned 9,808 acres in the matrix land allocation, and 8,066 acres in the Late Successional Reserve. Within the Matrix and outside of

¹ Fire intensity describes the rate at which a fire produces heat and is influenced by the amount of fuel (dead and live woody material) available, local weather conditions, and the topography of the site. It also refers to how the fire affected the canopy. In a high intensity fire, most, if not all of the canopy is burned, resulting in a stand replacement fire. In a moderate intensity fire, pockets of trees are stand replaced, while other parts are underburned. In a low intensity fire, most of the stand experiences a ground fire, with individual trees burned or killed by the fire. In a mosaic burn, there are pockets of low, moderate and high fire intensity. In an underburn, ground fuels are consumed, but the tree canopy remains primarily unburned.

riparian reserves and unsuitable soils, a total of 6,100 acres burned. Salvage proposals in this FEIS would treat at most 1,273 acres under Alternative 4 (20.8%), followed by 1,075 acres in Alternative 2 (17.6%), 934 acres in Alternative 6 (15%), 880 acres in Alternative 3 (14.4%), and 435 acres in Alternative 5 (7.1%).

When considering the entire 2002 Apple Fire (all land allocations), the proposal for salvage would affect less than 8% of the area burned, as displayed below (alternatives are listed in order of most fire area treated to the least fire area salvaged):

Alt 4 = 7.12%

Alt 2 = 6.01%

Alt 6 = 5.23%

Alt 3 = 4.92%

Alt 5 = 2.43%

Comments received during the 45-day public comment period requested estimates of the volume of the merchantable timber that burned at high intensity in the fire. The area is estimated to have had about 45 thousand board feet (MBF) of timber per acre (C. Adams, personal communication). This calculates to about 132,615,000 board feet of timber that was killed by the fire (2,947 acres of high intensity). When considering the older plantations that were stand replaced (with an average of 7,000 board feet per acre), an additional 8,750,000 board feet was killed.

Comments received during the 45-day public comment period requested estimates of the value of the underburning that occurred during the fire. The acreage of underburn that had a beneficial effect of reducing fuels was originally disclosed on page 9 of the DEIS and is now disclosed on page 13. About 9,520 acres of land identified as late-seral prone to fire in the Watershed Analysis was underburned. In addition, about 3,663 acres of late seral stands not identified as prone to fire were underburned in the planning area, also reducing fuels. It currently costs the Forest between \$364-\$795 per acre to underburn a late-successional stand. For the 9,520 acres of late successional forest that underburned within the 18,000-acre fire area, this would equate to between \$3.4 and \$7.5 million dollars. For the 3,663 acres of mid-late seral forests that were underburned, the cost of accomplishing this would equate to between \$1.3 and \$2.9 million dollars.

Apple Fire Suppression and Rehabilitation

Within the Panther Creek subwatershed, suppression of the Apple Fire utilized primarily indirect suppression techniques, meaning that the fire was suppressed using methods that did not put firefighters directly next to the burning fire front. Suppression activities are summarized in Table 9 in Chapter 3. Suppression activities included construction of over 10 miles of dozer line, which ranged from 8 to 16 feet in width and construction of just over 1 mile of 24 inch wide hand line. All lines were dug to mineral soil. Over 1,000 acres were intentionally burned during "burnout" operations, where fuels between the main fire and the suppression lines are burned in order to control and stop the spread of the main fire. Fire retardant, a mixture of water and chemicals that slow the spread of fire, was dropped on hot spots by helicopters carrying buckets of the retardant mixture from the mixing site, located in a rock quarry off Road 4714 (T27S, R01E, Sec. 9) to the fire. Safety zones, drop points, and helicopter landing spots were constructed; about 3.4 acres of land were cleared. Roads were brushed and graded so that safe driving conditions for

firefighting personnel were maintained and trees considered a hazard along roadways were felled.

Rehabilitation (rehab) of fire lines was initiated in September 2002 after it was determined that the fire would no longer threaten the area; water bars were dug to slow potential erosion and divert water off of the fire line. Vegetation cut during line construction or burned sticks and branches were pulled onto the fire lines to restore nutrients to the soil and lessen surface erosion. Safety zones, drop points, and helicopter landing spots were seeded with western fescue to prevent erosion. Additionally, teams of resource specialists began to determine rehabilitation needs. A Burned Area Emergency Response (BAER) Plan (located in the Project Record) was established and funding was sought to begin rehab work. Table 9 in Chapter 3 displays the BAER work that was completed and will continue within the perimeter of the Apple Fire. Road maintenance, road reconstruction, reforestation, instream log placement, and adding wood to small stream channels was accomplished under the BAER plan during the fall of 2002 and winter 2003.

Resource specialists began reconnaissance of the Apple Fire in October of 2002 to determine if salvage of burned trees was feasible. Under the 1990 LRMP (USDA 1990), salvage is permitted on lands suitable for timber production (IV-42). Initial field reconnaissance focused on the burned area within the Matrix land allocation; initially over 2,500 acres were looked at for potential salvage. Following intensive field reconnaissance over the winter of 2003, the Forest Service drafted a proposal for salvage that encompassed about 1,075 acres and initiated the environmental review process.

Concurrently with this process, the Forest completed a report that documented the post-fire conditions that existed across the forest. This document, the Wildfire Effects Evaluation Project (WEEP), describes the pre-fire and post-fire conditions of the forest following the record-setting fire season of 2002, which includes the effects of the fires in the North Umpqua Complex, the Apple Fire, and Tiller Complex (USDA 2003).

Comments received on the Baked Apple Fire Salvage DEIS indicated a desire to see a display of the acreage of merchantable timber that was killed during the entire fire season of 2002 in the North Umpqua Watershed. Within in the North Umpqua watershed, the other 2002 fires that burned merchantable timber included the Limpy Fire and the Calf 2 Fire (Table B). The Johnson Butte Fire burned in the Steamboat subwatershed, which is within the Late Successional Reserve in Steamboat Creek. That fire burned about 240 acres; 33 acres burned at high intensity.

The 68,862 acres burned on the Tiller Complex fires occurred primarily within the Late Successional Reserve; about 10,500 acres burned at high intensity, but are in scattered pockets throughout the Complex. These fires are located from 5-12 miles south of the Baked Apple planning area. Currently, salvage on the Tiller complex is proposed on about 375 acres in Matrix land. An additional salvage proposal for a portion of the Tiller complex within the LSR may be considered.

Table B. Acres of late seral forest burned within the North Umpqua 5th field watershed by land allocation.

Fire Name	Acres of Late Seral forest burned at high intensity	Total Acres affected by fire (all intensities)	Land Allocation	Acres proposed for salvage
Calf 2	51	346	Late Successional Reserve, Riparian Reserve	0
Limpy	92	859	Late Successional Reserve, Riparian Reserve	0
Apple	2,947	17,874	Matrix, Late Successional Reserve, Riparian Reserve, Congressionally Withdrawn	Ranges between 435 to over 1,400
TOTALS	3,090	19,079		2.2% to 7% of the burned late seral stands in the Middle North Umpqua are proposed for salvaged.

Planning Area Overview

The proposed action is within the Middle North Umpqua 5th field watershed² on the North Umpqua Ranger District (Figure 2). The planning area is located within the Panther Creek 6th field sub-watershed, which define the planning area. A small portion of the South Apple Facial subwatershed (1,760 acres) is also included; for simplicity, it will be incorporated into the description of the Panther Creek subwatershed. The planning area covers 13,925 acres of western cascade coniferous forest. Elevations range from 1,280 feet at the confluence of Panther Creek and the North Umpqua River, to just over 4,500 feet at the top of Bachelor Butte and over 4,900 feet near Lookout Mountain.

Natural resources include clean water, timber, recreation, fish, wildlife and others. The forests range from dry Douglas-fir and western hemlock to white and silver fir in the higher elevations. Sugar pine was noted along the river corridor. Forested landscape patterns have been historically influenced by wildfire which occurred with regular frequency within the planning area. Small dry, rocky openings punctuate the forest, especially along the steep slopes and ridgetops.

The Wild and Scenic North Umpqua River forms the northern edge of the planning area and is renowned for its fishery and recreational opportunities. Designated as a recreational river in 1988, the river and its' corridor receive heavy use from white water

² Fifth-field watersheds can range in size from 40,000 to 250,000 acres and are made up of multiple 6th field watersheds. Sixth-field watersheds can range in size from 10,000 to 40,000 acres, with some as small as 3,000 acres.

boaters and hikers. Beneficial uses of the North Umpqua River and its tributaries include public and private domestic water supply; industrial water supply, irrigation; livestock watering, anadromous fish passage, spawning and rearing; resident fish and aquatic life use; wildlife use and hunting; fishing; boating; water contact recreation; aesthetic quality; and hydropower.

The planning area is bounded to the North by the North Umpqua River, to the South by the North Umpqua River/Little River Divide, to the East by Calf Ridge, and to the West by Panther Ridge. The planning area includes all or portions of sections 9, 10, and 14 through 36, T26S, R1E; sections 19 and 30, T26S, R2E; and sections 2 through 5, and 9 through 11, T27S, R1E, Willamette Meridian, Douglas County, Oregon. Within the planning area, the 2002 Apple Fire stand-replaced about 2,066 acres and underburned 3,705 acres of what was mid or late seral forest before the fire, and stand-replaced about 1,942 acres and mosaic burned about 935 acres of what were plantations prior to the fire. The rest of the planning area was either unburned or lies outside of the fire boundary.

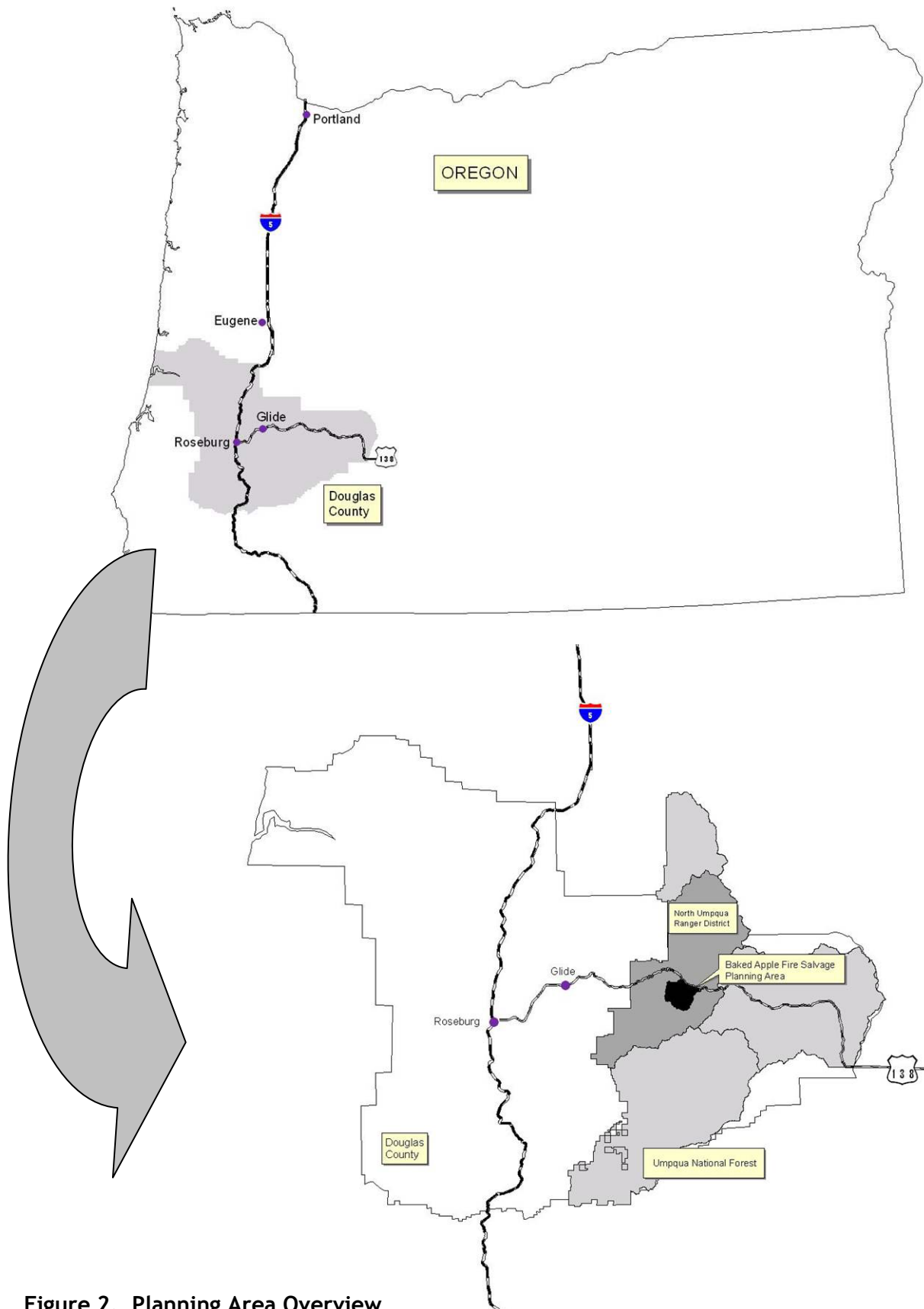


Figure 2. Planning Area Overview

PURPOSE OF AND NEED FOR ACTION

The proposed action is based on the need to recover the economic value of the burned wood in areas that were stand replaced in the Panther Creek subwatershed before it decays and to reduce existing and created fuels in the burned area. The overall goal for land management in the Middle North Umpqua watershed is to move it towards the desired future condition of a healthy, productive forest that will provide the range of forest commodities described in the watershed analysis document on a long-term, sustainable basis (USDA 2001). The difference between the existing conditions and the desired conditions defines the purpose of and need for action in terms of elements that can be measured. These 'elements' are:

Element 1 – Timber Salvage and Reforestation

The timber salvage proposal is based on the need to recover dead merchantable timber before its value is lost to decay and deterioration. Over 2,000 acres of the mid and late seral forest within the planning area burned at high intensity. The removal of some of the dead³ trees (Figure 3) that burned would cover the cost of both the removal and the revegetation of the area, and would restore the area to the desired condition of a productive forest. The planning area is allocated as Matrix land in the Northwest Forest Plan, where timber harvest is a primary goal. Salvaging some of the burned dead trees and reforesting the area complies with direction in the Northwest Forest Plan and moves the existing condition of a burned landscape toward the desired condition of a forested landscape capable of supporting timber production.

Element 1 will be measured by:

- Volume and acreage of timber salvaged under each alternative
- Acres of reforestation (and subsequent survival)



Figure 3. Dead trees would be salvaged, such as those on the left, while green trees shown on the right would remain, except those felled for safety, in logging corridors, or on temporary roads.

³ This salvage proposal would remove only dead trees. Dead trees are those that have no visible green needles at the time of marking. The only green trees that would be felled would be those that are considered danger trees along roads or landings, those that are in logging corridors, or those that are in the path of temporary roads that would be constructed.

Element 2 – Hazardous Fuels Reduction

The slash treatment proposal is based on the need to reduce activity-generated and existing dead fuels in order to keep fuel loads within parameters prescribed by the Forest. Currently, fuel loads within some of the areas burned by the fire exceed 300 tons per acre. If all of this biomass were left standing, within 25 years, it is predicted that over 700 tons per acre of fuels would cover the ground on areas that currently have high fuel loads. Salvage activities would reduce the fuels that were created by the fire. Treating the slash would reduce additional fuels to a level that would reduce the risk of contributing to future fire intensity and spread.

Element 2 will be measured by:

- Range of tons per acre of hazardous fuels remaining on the salvage units under each alternative
- Predicted future wildfire size

PROPOSED ACTION

Comments received on the DEIS requested additional information as to how the proposed action was developed and why so many areas were never looked at. The proposed action was developed following extensive field reconnaissance of the fire area. The District Ranger provided direction to the team, both verbally during initial field reconnaissance and in the Project Initiation Letter (03/07/03). In the letter, she directed the team to focus salvage on merchantable timber within the most severely burned portions of the 13,925 acre Panther Creek subwatershed that are within the Matrix land allocation. The Ranger directed the team to focus on a proposal that would specifically avoid all roadless areas, the wild and scenic river corridor and the visually sensitive areas within the corridor, spotted owl cores, all lands that are classified as unsuitable, unstable, or within riparian reserves, and avoids all known cultural resources. Additional project area guidelines were set by requiring the team to:

- Minimize impacts to water quality by utilizing helicopter systems when possible.
- Minimize impacts to water quality by maintaining full Riparian Reserves.
- Utilize existing roads where possible - no new permanent roads were to be built. New temporary ridge-top roads may be constructed, used and decommissioned within one season.
- Maintain unique habitats.
- Minimize impacts to unsuitable and sensitive soils.
- Ensure that down wood and snag requirements for wildlife needs and long-term site productivity are met.

From the 2,500 acres initially evaluated, the team followed the District Ranger's direction and eliminated riparian reserves, unsuitable soils areas, the Wild and Scenic River corridor, logistically unfeasible areas, areas with too small of trees, and other areas of concern. The resultant proposed action was developed and is described below.

For the Baked Apple Fire Salvage Project, the North Umpqua Ranger District, Umpqua National Forest proposes to:

- Salvage approximately 1,075 acres of dead trees in burned stands within the Panther Creek subwatershed that, before the fire, were late-seral or mid-seral forest (Figure 6).
- Retaining between 6 and 12 trees per acre for shade, large wood, and snag habitat;
- Reforest and protect seedlings on 957 acres that would be salvaged;
- Treat logging-created slash⁴ on 1,030 acres that would be salvaged;
- Complete haul related road work that includes commercial use of 55 miles of road, and reconstruction (replacing plugged culverts and stabilizing slopes) of 2 sites along Forest Service Road 4714;
- Construct (about 0.80 miles) and reconstruct (about 0.44 miles) temporary spur roads (non-system roads used for logging only, decommissioned after use);
- Reconstruct or expand up to 35 landings, construct 4 new landings (totaling about 3 acres), and use 2 existing rock pits to facilitate logging and log haul.

The areas prescribed for salvage would utilize a combination of helicopter (601 acres), skyline (443 acres) and loader (30 acres) harvesting equipment. The proposed action is expected to yield about 44 million board feet of timber. Felling and retention of 2 snags per acre on all salvage units to provide down woody debris would occur to maintain and enhance soil productivity. Green trees, where they exist, are retained within the salvage units; however, some green trees would be felled for safety throughout the planning area along roads, around landings, and in skyline corridors. The proposed action specifically avoids salvage in riparian reserves, known cultural resources, late-successional reserves, wilderness areas and inventoried roadless areas. There are no salvage units within the North Umpqua Wild and Scenic River Corridor. No amendments to the Forest Plan are proposed.

DECISIONS TO BE MADE BASED ON THIS ANALYSIS

Based on the analysis documented in this environmental impact statement, the Responsible Official, the District Ranger of the North Umpqua Ranger District, will make the following decisions:

- To implement this project as proposed; to implement a modified version (alternative) of this project which addresses unresolved issues; or not implement this project at this time;
- To decide which management requirements, mitigation measures, monitoring and water quality best management practices are necessary to achieve resource goals, objectives and the desired future condition.

⁴ Slash treatment includes under/broadcast burning, grapple piling and burning the piles, hand piling and burning the piles, and yarding tops of the trees to the landing while still attached to the logs.

RELATIONSHIP TO FOREST PLANS, ROADS ANALYSIS, THE PROJECT RECORD, AND THE MIDDLE NORTH UMPQUA WATERSHED ANALYSIS

Forest Plan: The 1990 Umpqua National Forest Land and Resource Management Plan (LRMP) and its amendments to date, including the 1994 Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, provide broad management direction for the proposed action. The project area is identified as Management Areas⁵ 7, 10, and 11 in the LRMP. The proposed action would occur within the Matrix land allocation as described by the ROD; matrix land is where most scheduled timber harvest on the Forest is to occur. Riparian Reserves are also located in the project area. All applicable Standards and Guidelines were applied in deriving the proposed action and alternatives to the proposed action.

Roads Analysis: A roads analysis for the planning area was completed in July of 2003. This analysis led to recommendations for future road work within the planning area; future road work would be considered under a separate analysis.

Project Record: This FEIS hereby incorporates by reference the Project Record (40 CFR 1502.21). Chapter 3 provides a summary of the Specialist Reports in adequate detail to support the rationale for the decisions and the appendices provide supporting documentation. The Project Record contains Specialist Reports and other technical documentation used to support the analysis and conclusions in this FEIS. The Specialist Reports incorporated by reference are for Forest Vegetation, Insects and Disease, Fire and Fuels, Air Quality Wildlife, Soils, Hydrology, Fisheries, Geology, Scenery, Recreation, Botany and Noxious Weeds, Cultural Resources, Safety, Roads, Logging Systems, and Socio-Economics.

Incorporating these Specialist Reports and the Project Record helps implement the CEQ Regulations provision that agencies should reduce NEPA paperwork (40 CFR 1500.4), that EISs shall be “analytic rather than encyclopedic, and that EISs shall be kept concise and no longer than absolutely necessary” (40 CFR 1502.2). The objective is to furnish adequate site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the North Umpqua Ranger District Office, 18782 North Umpqua Highway, Glide, OR 97443, Monday through Friday, 7 a.m. to 4:30 p.m.

Watershed Analysis: Watershed Analysis, one of the four components of the Aquatic Conservation Strategy (ACS), was completed in the Middle North Umpqua 5th Field Watershed in 2001. The ACS was developed to restore and maintain the long-term ecological health of watersheds and aquatic ecosystems. This strategy is applied over broad landscapes, as opposed to individual projects or small watersheds. The ACS seeks to accomplish this goal by maintaining the natural disturbance regime which operates over long time scales, on the order of decades or longer (USDA/USDI 1994). To help attain the goal of the ACS, a landscape plan was developed in the Middle North Umpqua watershed analysis that would re-establish landscape patterns associated with the local natural

⁵ Management Area 7 will be managed to protect outstandingly remarkable values as part of the North Umpqua Wild and Scenic River - no activities are proposed in the Wild and Scenic River Corridor; Management Area 10 is managed for producing timber on a cost-efficient sustainable basis; and Management Area 11 is managed to provide big game winter range habitat and timber production.

disturbance regime (USDA 2001). The 2001 Middle North Umpqua Watershed Analysis (WA) documents historic, existing and desired conditions for the 5th field watershed; the Baked Apple Planning Area is part of this 5th field watershed. A summary of all recommendations and how they apply to the planning area are described in detail in the document titled “Recommendations that Apply to the Baked Apple Fire Salvage,” incorporated by reference and found in the Project Record.

Goals and Desired Condition Described for the Watershed in the Watershed Analysis:

The overall goal for land management in the Middle North Umpqua watershed is to move it towards the desired condition of a healthy, productive forest that provides a range of forest commodities on a long-term, sustainable basis (USDA 2001). Within the Matrix land allocation, the emphasis is to provide a predictable and sustainable level of timber into the future using a scientifically sound and ecologically credible plan (USDA 2001).

The watershed analysis uses concepts similar to those in the Blue River and Augusta Creek management plans (Cissel et al. 1998 & 2002) to describe landscape patterns. These concepts were used for recommending future management actions designed to move the forest landscape patterns back toward the natural pattern established historically by fire. Using landscape planning and information specific to the watershed, the Middle North Umpqua watershed was divided into four ecologically different Landscape Areas based on the disturbance regime, broad environmental gradients, and forest types that are described in the WA. These include the Steep/Dry, Moderate, High Elevation, and Gentle/Moist Landscape Areas.

Two primary Landscape Areas are found within the Baked Apple Planning Area (Figure 4). These are the “Steep/Dry” and “Moderate” Landscape Areas. The western portion of the planning area lies within the Gentle/Moist Landscape Area; however, only about 35 acres of proposed salvage units lie within this zone. A small portion of the High Elevation Landscape Area is located at the south end of the planning area. Only 11 acres of this landscape area are proposed for salvage.

The 2002 Apple Fire demonstrated that the majority of the Limpy/Bachelor Creek area responded predictably as a Steep/Dry Landscape Area; a similar, stand replacing fire occurred in this area about 120 years ago. The landscape area map that was created in the Watershed Analysis can be adjusted to encompass the boundary of the 2002 Apple Fire to further refine the Landscape Area maps.

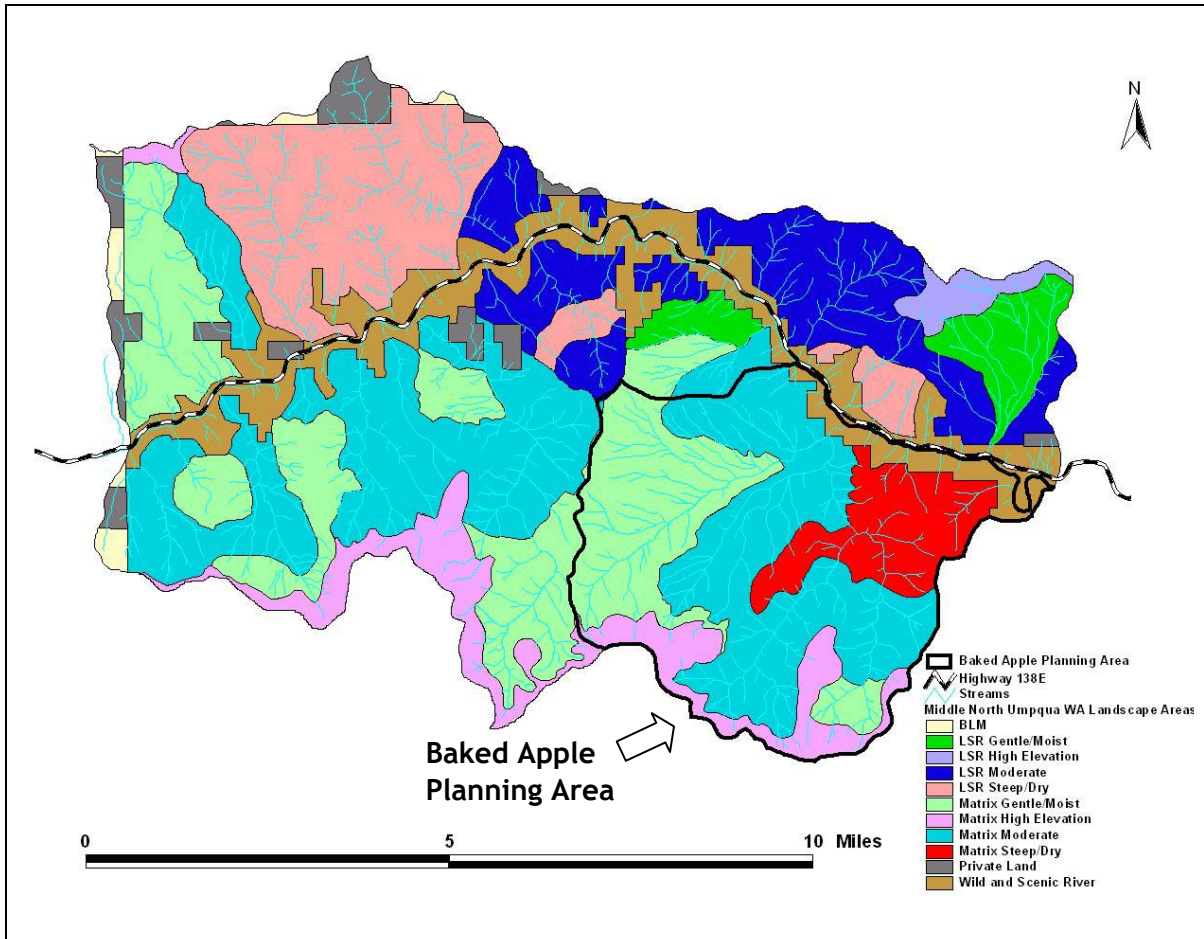


Figure 4. Landscape Areas in the Middle North Umpqua 5th Field Watershed, which includes the Baked Apple Planning Area.

The proposed salvage and related activities would implement many of the Middle North Umpqua Watershed Analysis recommendations; some of these recommendations, which are **bolded**, with a brief response in *italics*, are listed below:

- 1) **Fuels Reduction** - *The fire reduced fuels by underburning about 9,520 acres of land identified as late-seral prone to fire in the Watershed Analysis. In addition, about 3,663 acres of late seral stands not identified as prone to fire were underburned in the planning area, also reducing fuels. However, the fire created a future fuels hazard in the areas that were burned at high intensity. This project would reduce that future fire hazard.*
- 2) **Timber Harvesting** - *Timber management in the form of salvage is proposed with this project.*
- 3) **Road Analysis** - *A roads analysis was completed as described above.*
- 4) **Revegetation and use of native plants** - *About 20 acres of seeding with blue wild rye occurred within the fire area to help lessen noxious weed infestations. Native species are also proposed for use with this project during reforestation.*

SCOPING

Scoping (a process used to surface issues) for the Baked Apple Fire Salvage project began with several public forums and meetings after the fire was contained⁶. A town hall meeting to share what the District had learned about the fire was held in Glide, Oregon on December 10th, 2002. Additional town hall meetings were held on March 4th, 2003 in Roseburg, Oregon and on May 5th, 2003, also in Roseburg. Interdisciplinary team meetings to review alternatives and integrate information specialists had learned were open to the public on May 6th, 2003 and on June 12th, 2003. Seven field trips occurred where the interested and affected persons viewed the fire salvage area, learned about resource concerns, and provided their ideas of how to proceed.

Based on the potential effects of the proposed action, the District Ranger determined that an environmental impact statement was the appropriate format for disclosing potential impacts. The Notice of Intent to prepare an Environmental Impact Statement for the Baked Apple Fire Salvage Project was published in the March 17, 2003 Federal Register (68 FR 12662). Scoping continued and the project was first listed in the April 2003 Umpqua National Forest Quarterly Schedule of Proposed Actions (SOPA).

Seventy-five comment letters were received during scoping. The Tribes (Cow Creek Band of Umpqua Indians, Confederated Tribe of the Grand Ronde Indians, and the Confederated Tribe of the Siletz Indians) were consulted; the Cow Creek Band of Umpqua Indians indicated full support for the project. No other tribal interests responded to the proposal. Concerns from the public ranged from not salvaging fast enough, opposition to salvage, and a request to conduct restoration activities only. Numerous letters indicated support for managing the area using the “Beschta⁷” approach. For full details, please see the scoping summary (available upon request) in the Project Record.

ISSUES

Significant issues associated with a proposed action are the focus of an environmental impact statement because they provide the basis for formulating and comparing alternatives to the proposed action (40 CFR 1502.14). Significant issues are based on unresolved conflicts concerning alternative uses of available resources. Issues are points of debate, dispute or disagreement over the effects of the proposed action.

Scoping identified a number of issues and concerns related to proposed salvage of timber in the Panther Creek subwatershed. These issues, together with applicable laws, regulations, and policies, were used to develop alternatives. In order to help quantify or

⁶ Numerous public meetings were held during fire suppression activities to inform homeowners and other interested persons of the status of the fire. Scoping for the salvage project began after the fire was suppressed.

⁷ The Beschta Report is a paper authored by several scientists. They reviewed past and current literature and developed a set of recommendations for land managers to apply. The paper offers a scientific framework of principles and practices to guide development of federal policy concerning wildfire and salvage logging and other postfire treatments. The paper is titled “WILDFIRE AND SALVAGE LOGGING - Recommendations for Ecologically Sound Post-Fire Salvage Management and Other Post-Fire Treatments On Federal Lands in the West” and is authored by: Dr. Robert L. Beschta, Oregon State University; Dr. Christopher A. Frissell, Oregon State University and University of Montana; Dr. Robert Gresswell, U.S. Fish and Wildlife Service; Dr. Richard Hauer, University of Montana; Dr. James R. Karr, University of Washington; Dr. G. Wayne Minshall, Idaho State University; Dr. David A. Perry, Oregon State University, Jonathan J. Rhodes, Columbia River Inter-Tribal Fish Commission.

qualify the issue, issues indicators are displayed; these indicators will help measure how each alternative responds to the issue. Issues that drove the development of alternatives for the Baked Apple Fire Salvage Project are as follows:

1. Salvage logging will decrease the current and future availability of down, dead woody material as trees that have commercial value are salvaged. Dead trees have multiple ecological roles including functioning as an important element in biological and physical processes, and providing for future soil and site productivity.

Indicator: Trees and/or snags retained per acre within salvage units.

2. The proposed salvage has the potential to impact late-successional/old growth stands. Some stands that experienced a less intense burn have remnant components of old growth and can still be considered as functional late-successional habitat. The proposed salvage may result in felling or damage to large, live trees during logging or through the creation of logging corridors and landings.

Indicators: Acres of underburned late-successional habitat salvaged; impacts to the character of late-successional habitat.

3. The proposed salvage will decrease stand size and diversity by removing dead trees greater than 20 inches in diameter at breast height (dbh) or removing dead trees greater than one hundred fifty years of age; and will decrease size class diversity by salvaging more than 50% of the dead trees within each size class.

Indicators: Acres of units that do not retain 50% of the dead trees within each size class; upper diameter limit of salvage.

4. The proposed salvage and related activities have the potential to impact some of the beneficial uses of the aquatic system through increased delivery of sediment to Panther, Limpy, Fairy, and Bachelor Creeks and their associated tributaries.

Indicators: Percent of treatment acres with less than 85% effective ground cover; treatment acres at risk of slope instability.

5. The proposed use of helicopter logging may result in low or no returns to the treasury or may not be economically feasible. The high costs of the proposed helicopter logging will reduce the amount of money returned to the federal treasury and reduce the amount of money available for restoration projects funded through Knudsen-Vandenberg funds. In addition, helicopter logging may not attract a bidder to the timber sale.

Indicators: Benefit/cost ratio; net present value.

6. The areas not proposed for salvage (especially those designated as unplantable) and other untreated areas (including riparian reserves), will have high fuel loads in the future, increasing future fire risk. As time passes, it is estimated that 60-100 tons per acre of biomass (or more) will fall to the ground as the trees killed by the fire deteriorate. If a fire were to occur, this high fuel loading would increase the risk of a high severity fire.

Indicator: Acres of potential high fuels loads not proposed for salvage.

7. Several groups (Umpqua Watersheds, Cascadia Wildlands, Wilderness Society, Sierra Club, and ONRC) state that a 1,300-acre uninventoried roadless area lies

within and adjacent to the headwaters of Limpy Creek and a 1,700 acre roadless area lies along the Wild and Scenic Corridor and in the Horseshoe Bend area. The Middle North Umpqua Watershed Analysis (USDA 2001, page 103) displays these areas as having low road densities, ranging from 0 to 1.5 miles of road per square mile of land. Although roadless designation is outside the scope of this project (it is decided at the Forest Plan or higher level), the proposed project has the potential to impact the lands within these low road density areas.

Indicators: Acres of low road density areas salvaged; miles of temporary spur road constructed or reconstructed; impacts to the character of low road density areas.

8. Burning of logging-created slash during the spring may impact landbirds slated for consideration and protection under the USDA Forest Service Landbird Strategic Plan (2002).

Indicator: Acres of spring burning by alternative.

ISSUES THAT DID NOT DRIVE ALTERNATIVES

In addition to the significant issues listed above, four other issues were considered. These four issues did not lead to more alternatives because mitigation was developed to address them. These four issues and their mitigation are listed below; they are discussed briefly in the EIS for full disclosure.

Safety of workers, the public, and agency employees

The proposed retention of dead trees along roads and within salvage units creates a risk to the public, forest workers, and agency employees. There are numerous safety requirements and mitigation measures that are designated in order to minimize this hazard, and are included in Chapter 2. This issue is mitigated, but will be tracked for disclosure purposes.

Soil impacts

In areas where full suspension cannot be achieved, the proposed use of skyline logging may cause gouges to the soil as some logs are yarded to the landing with one-end suspension.

This was mitigated, as provisions in the Timber Sale Contract (current policy) allow the Forest to use management requirements and Best Management Practices that would minimize impacts to the soil from yarding-related gouging. This issue will be tracked for full disclosure.

Loss of Vehicular Access

Short-term road closures will reduce public and administrative access to areas that are presently accessible. For log haul, 2 sites, totaling 0.2 miles, of reconstruction along Forest Service Road 4714 would be accomplished, leading to short-term closures during reconstruction; however, long-term access to the area would be maintained.

This issue is mitigated by maintaining alternate travel routes within the planning area. This issue will be carried through the analysis as the Forest Transportation

Systems Policy calls for public input, analysis and disclosure of the effects of road-related decisions.

Effects of Noxious Weeds on Native Plant Diversity and Productivity

Proposed salvage activities (including timber haul, project-related access, and road work) have the potential to spread noxious weeds that occur throughout the area, in particular, meadow knapweed. Continued vehicular access, project activities, and ground disturbance in the area would encourage spread of this and other noxious weeds.

This issue is mitigated because management requirements will reduce the potential spread of this weed, and KV projects are designed to control current infestations. This issue will be tracked for full disclosure.

NON-SIGNIFICANT ISSUE

One other issue was raised during scoping and was dismissed as a non-significant issue; non-significant issues are those that are outside the scope of the proposed action; are already decided by law, regulation, Forest Plan, or other higher level decisions; are irrelevant to the decision made, or are conjectural and not supported by scientific evidence.

Rewarding Arsonists by Salvaging Burned Areas

Several members of the public raised the concern over salvaging an area that was intentionally burned by what they believe was arson. Forest Service investigations into the exact cause of the 2002 Apple Fire are on-going, although it is known that it was human-caused. The motivation of the person who started the fire may never be known, nor will it be possible to determine if recovering the economic value of the burned wood is a “reward” to whomever started the fire. Therefore, this issue is determined to be a non-significant issue, as it is conjectural and not based on any scientific evidence.

This page intentionally left blank

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

INTRODUCTION

This chapter describes the components and scope of the human environment that may be affected by implementation of the alternatives outlined in Chapter 2 and discloses the potential consequences of implementing each alternative including the mitigation measures, watershed best management practices and management requirements associated with each alternative. The description of the affected environment centers primarily on the issues outlined in Chapter 1, but it also briefly discusses other resources that may potentially be affected. A complete description of each alternative is found in Chapter 2. This chapter presents the scientific and analytic basis for the comparison of alternatives. The effects are discussed in terms of social and environmental changes from the current situation and include quantitative assessments where possible as well as qualitative assessments. All discussions are tiered to the Umpqua National Forest Plan Final Environmental Impact Statement, as amended. In addition, many of the discussions in this chapter utilize the information found in the 2001 Middle North Umpqua Watershed Analysis.

CHANGES BETWEEN DRAFT AND FINAL

Several regional changes to the Northwest Forest Plan were enacted in March of 2004. On March 22, 2004, the Secretaries of Interior and Agriculture signed the Record of Decision for the Northwest Forest Plan, amending the 1994 document with the decision to clarify provisions relating to the Aquatic Conservation Strategy (ACS ROD). The ACS ROD became effective immediately upon its signature. The primary changes made by the ACS ROD include the new provision that no finding of ACS consistency is required at the project level; and in order to comply with Riparian Reserve Standards and Guidelines that reference ACS objectives, the Forest must follow the procedures described in the ACS ROD. These procedures are found in the language amending page B-10 and page C-31 of the 1994 Northwest Forest Plan ROD. This FEIS complies with that new direction; changes to the language addressing ACS consistency and Riparian Reserves is found throughout Chapter 3.

On that same day the ACS ROD was signed, the Secretaries of Interior and Agriculture signed the Record of Decision to remove or modify the Survey and Manage mitigation measure Standards and Guidelines in the Northwest Forest Plan (S&M ROD). The S&M ROD becomes effective on April 21, 2004. The primary changes made by the S&M ROD include the elimination of portions of Survey and Manage Mitigation Measures for most species, the inclusion of some species onto the Regional Foresters Sensitive Species List (for Region 6). There is also more reliance on the other habitat conservation elements provided by the Northwest Forest Plan to conserve and protect species formally known as Survey and Manage. This FEIS complies with the new provisions in the S&M ROD; changes to those species are found throughout Chapter 3.

In addition to the ACS ROD and S&M ROD signing on March 22, 2004, the Regional Forester announced changes to the management of the Oregon Coastal coho Salmon. Because of a recent court opinion, consultation under ESA with NOAA Fisheries is no longer required for the Oregon Coast coho salmon Evolutionary Significant Unit. Because NOAA Fisheries will continue to study the coho, the Regional Forester added the Oregon Coast coho salmon ESU to the Regional Forester’s Sensitive Species List, due to its potential for Federal Listing under ESA. This project originally found that all activities under all alternatives would Not Likely Adversely Affect (NLAA) coho salmon. The appropriate finding similar to a NLAA for a Sensitive species is May Impact Individuals, but is Not Likely to Contribute to a Trend Towards Federal Listing. No changes in the alternatives occurred as a result of this change in species designation. All findings previously documented in the DEIS are still relevant in the FEIS.

Other changes that occurred in this chapter of the FEIS include the addition of information requested during the 45-day public comment period; the correction and addition of information to portions of the soils section based on additional spatial analysis and review by the Regional Soils Scientist; the addition of monitoring information collected this past year on the Tree Mortality plots; and the addition of information on Tribal consultation and Environmental Justice.

ACTIVITIES THAT CONTRIBUTE TO CUMULATIVE EFFECTS:

Potential cumulative effects are analyzed by considering the proposed activities in the context of the past, present, and reasonably foreseeable actions in the Panther Creek subwatershed. The following past management activities have occurred in the analysis area (Table 8).

Table 8. Past management activities in the Panther Creek subwatershed.

Activity Type	Total Acres	Acres by Decade/Type	Notes
Commercial Thinning (1971 - 1988)	1182	1970's - 854 1980's - 328	Single-span skyline for all acres
Planting (1975 - 1998)	4995	1950's - 539 1960's - 1221 1970's - 608 1980's - 977 1990's - 1650	
Pre-commercial thinning (1975 - 2003)	3491	1970's - 423 1980's - 1118 1990's - 1906 2000's - 44	
Final Overstory Removal of Shelterwood	334	1980's - 344	Single-span skyline for all acres
Fertilization (1980 - 1993)	1798	1980's - 935 1990's - 863	
Regeneration Harvest	5080	Acres stand replaced in 2002 1950's - 1011 3 1960's - 1436 832	All recorded as skyline logged

Activity Type	Total Acres	Acres by Decade/Type	Notes
(1954 - 1996)		1970's - 734 407 1980's - 1275 831 1990's - 624 380	
Burning/Fuels Treatment (1954 - 1995)	5816	1950's: 946 of broadcast burn 1960's: 1377 of broadcast burn 22 of burning landings 56 of no fuels treatment 1970's: 200 of broadcast burn 74 of burning landings 853 of burning piles 1980's: 739 of broadcast burn 664 of burning piles 27 of burning landings 116 of no fuels treatment 1990's: 179 of broadcast burn 379 of pile burning 105 of no fuels treatment 40 of piling, but no burning 20 of mechanical biomass removal 19 of mechanical fuels disposal	Summary by decade: 1950's - 946 1960's - 1455 1970's - 1127 1980's - 1546 1990's - 742
1987 Apple Fire	2040		Apple Fire of 1987.
Fire salvage from 1987 Apple Fire	241	241 from 1988 to 1990	Skyline and helicopter logged.
Fire suppression from 1987 Apple Fire		Dozer and Hand Line; retardant dropped by plane along WSR corridor.	
Road Building	94.6 miles	Began in 1953	Road maintenance will continue throughout the drainage
2002 Apple Fire	8835	These are the acres of the Apple Fire within the planning area (all burn intensities).	Apple Fire of 2002.

Numerous other fires also burned during 2002. The North Umpqua Complex, started by lightning in July of 2002, included the Calf 2 Fire, which was directly to the east of the planning area, and burned about 543 acres. The Limpy Fire, located across the North Umpqua River near Limpy Rock, burned about 859 acres, and was also part of the complex. The Tiller Complex of fires burned almost 70,000 acres during the record breaking fire season of 2002; these fires occurred on the Tiller Ranger District, located about 8 air miles southwest of the planning area.

Fire suppression activities that occurred as part of the 2002 Apple Fire may also contribute to cumulative effects. Table 9 displays the activities that occurred within the planning area as part of suppression activities and emergency rehabilitation associated with the Apple Fire.

Table 9. Fire Suppression and Burned Area Emergency Response (BAER) Activities for the 2002 Apple Fire - Past and Present.

Activity Type	Total Acres/Miles	Notes
Fire line construction	10.2 - dozer line 1.02 - hand line	Dozer line width ranged from 8 to 16 feet. Hand line was approximately 24 inches. All lines were dug to mineral soil. All firelines were rehabbed and water barred by October of 2002.
Burnout	1,033 acres	Burnout conducted from 8/24/03 to 9/4/03.
Retardant	56,070 gallons ordered; 28,000 gallons used.	All retardant was dropped by a helicopter using a bucket.
Constructed points	5 Drop Points 2 Helispots 8 Safety Zones	About 3.4 acres total disturbed; rehabbed by October of 2002. Seeded with western fescue.
Road Maintenance	42.5 miles	General road maintenance conducted throughout area; 4 additional miles treated outside planning area.
Hazard Tree Felling	41 miles	Hazard trees felled along main roads
Ditches cleaned	22.5 miles; 50 segments	Ditches cleaned out
Gates Installed	22 miles of road closed; 5 segments; 3 total gates.	Gates installed; now open.
Culverts cleaned	18.3 miles; 5 segments	Culverts cleaned out and checked.
Road grading	1.86 miles; 2 segments	Road graded by Forest grader.
Miscellaneous road work: Install down pipe Install grade sags Reconstruct fill Rock blanket/sag Scaling Slotted riser/collared Burn hole repair Deepen ditch Fill pullback	 1 site 8 sites 1 site 1 site 1 site 1 site 6 sites 1 site 11 sites	A total of 31 points had road work as described below. Each site was less than 0.5 acre in size. A total of no more than 16 acres was disturbed. Scaling is removing loose rock from bank. Prevents culvert plugging.
Reforestation	286 acres	Planted seedlings, installed mulch mats on 118 acres and tubes on 213 acres, including planting about 75 feet on either side of the lower 3 miles of Limpy Creek.
Instream log placement	3 miles of Limpy Ck. and Bachelor Ck.	78 pieces of large wood added to lower Limpy Ck; 26 pieces added to lower Bachelor Ck. using a helicopter.
Felling of wood in Class III and IV channels	6 miles of non-fish bearing streams	Clusters of trees (1-10 pieces) were felled w/chainsaw into the channel to slow water velocities, capturing, storing, and metering sediment, and capturing additional wood.

Reasonably foreseeable actions in the Panther Creek Watershed can also contribute to cumulative effects (Table 10). No private land is located in this 6th field watershed. For the Umpqua National Forest, the following activities are likely to occur over the next five years.

Table 10. Reasonably foreseeable actions in the planning area.

Activity Type	Total Acres/Miles	Notes
Apple Seed Stand Improvement Project	45 acres stem removal; 67 acres fuels treatment; 112 acres reforestation; 0.25 miles temp road construction and decommissioning.	Expected yield of about 500,000 board feet; logging expected to begin during the summer of 2003.
Reforestation	About 1600 acres planned for FY04 and FY05 for areas not included in Baked Apple or Apple Seed.	Additional planting likely to occur in future years as funds are appropriated.
Continued and Future Road Work	Road maintenance to continue as needed; possible road decommissioning, culvert upgrade, etc., as a result of Baked Apple Roads Analysis.	Occurring yearly.
North Umpqua Trail Reconstruction	Reconstruction/relocation of the Calf Segment.	Reconnaissance has begun; no proposed action yet.
Felix Timber Sale	Haul down Road 4714.	May not be reasonably foreseeable; depends on Rothstein ruling.

Portions of the 2002 fires that occurred on the Tiller Ranger District are also proposed for salvage. The Ash Creek Fire Salvage proposes salvage on about 251 acres, while the Acker Salvage proposes salvage on less than 200 acres. In addition, the Late-successional Reserve (LSR) burned by the Tiller Fires may potentially salvage additional acres and create fuel breaks along roads. Monitoring of future tree mortality may eventually result in additional salvage on both the North Umpqua and Tiller Ranger Districts.

TERRESTRIAL ENVIRONMENT

FIRE AND FUELS

Background and the Affected Environment

Scoping identified that areas not proposed for salvage would have high fuel loads in the future, increasing future fire hazard. This issue is tracked in this chapter under the title of fuel loadings.

Fire History

The fire history for the Middle North Umpqua watershed and the planning area was determined in the Middle North Umpqua Watershed Analysis (2001) by collecting data in 10 plots within the Blitzen (west of the planning area) and Panther subwatersheds. Of the 89 stumps tallied, all had visible fire scars. Figure 13 shows the fires per decade in the planning area for the decades of 1970 through 2000. Within the planning area there is an average of 13 fires per decade and 1 fire per year.

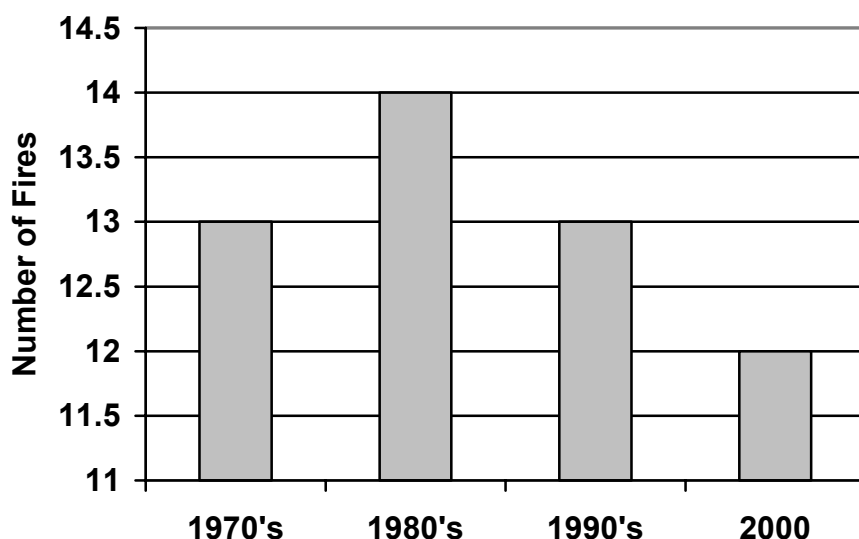


Figure 13. Fires per decade in the Baked Apple Planning Area.

Only the fire scars with a high-count reliability were used for the determination of a fire return interval. Fire episodes were supported by pitch ring data and stand age class determinations. Years between fires ranged from 14 to 114 years. The mean fire return interval for the planning area is about 30 years (USDA 2001).

Fire frequency for the planning area is based on fire occurrence records from 1970 through 1996. In that time period, there were 103 fires recorded within or adjacent to the Middle North Umpqua watershed. These fires totaled about 19% of the District's fires for that time period. Overall, there is a 7% chance of a fire occurring on any given 1,000 acre parcel for any given year. Over the next fourteen years, it can be expected that a fire could occur within each 1,000-acre block within the watershed. The probability of one or more of these fires reaching 100 acres in size is 79%. There is a 32% chance that at least one of these fires will burn between 100-1,000 acres.

The Middle North Umpqua Watershed appears to have unique characteristics to support frequent high intensity fires. Several items support this:

- Based on analysis of the vegetation patterns and predicted stand ages on the 1946 aerial photos, the watershed experienced high intensity stand replacement fires (several thousand acres in size) over a short time frame of 30 to 80 years.

- The watershed was comprised of several thousand acres of mid-seral stands that, based on the stand patterns, were recovering from stand replacement fires when new stand replacement fires occurred.
- The lightning frequency of this area is high.
- The North Umpqua River drainage provides unique weather and wind patterns that do not occur elsewhere on the district.

Fuel Models and Fire Regimes¹⁴

The WEEP (Wildfire Effects Evaluation Project) report (USDA 2003), describes the changes in fuels that have occurred on the Umpqua National Forest, including the area where the 2002 Apple Fire burned. According to WEEP, fire suppression has prevented fire from playing its natural role for at least one or more fire cycles in the low severity fire regime areas and possibly one fire cycle in the moderate severity regimes. This has created a condition allowing for an increase in fuel buildup, increase in stand densities, and change in stand structure. Coupled with climatic changes, this has resulted in stand structure changes that can include an increase in fire intolerant species that would have been naturally thinned by fire, in the intermediate level between the shrub layer and the overstory canopy. These changes resulted in stands that are more susceptible to high intensity fires. Fire intensity is influenced by the amount of fuel available for burning, local weather conditions before and at the time of the fire, and topography of the burning site. The limiting factor in fire intensity is the amount of energy stored in a fuel. As a consequence, the greater the fuel loading (amount of available fuel) the more intensely a fire is likely to burn. This was true in Panther Creek, which had many areas with high fuel loads before the 2002 Apple Fire began (USDA 2003).

FUEL MODELS: Fuels are classified by vegetation type, fuel size and loading, and potential fire behavior. Fuel loading can be described using models that can help predict what the fire behavior of a certain area would be like. These models are called Fire Behavior Prediction System (FBPS) Fuel Models and are assigned numeric values. Fuel Models 5 and 10 dominated the pre-fire landscape (Figures 14 and 15). Fuel Model 10 represents most of the late-seral forested stands before the 2002 Apple Fire. Fuel Model 10 stands are often overstocked with large amounts of dead fuel greater than 3 inches in diameter, creating a condition where fires burn in surface and ground fuels with greater intensity. Crown torching of individual trees is more frequent in these stands, making fire suppression difficult.

Fuel Model 5 best represents the early seral vegetation in the planning area and includes shrub communities and even-aged young plantations. Fire can spread readily through the tree tops of these young stands: rates of fire spread can be high, and significant areas of mortality can occur in and adjacent to these stands.

¹⁴ Fire Regimes are the historical frequency and severity of fire within a vegetative group. It includes characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.



Figure 14. Fuel Model 5.



Figure 15. Fuel Model 10

The 2002 fires burned across the landscape for several weeks, creating a mosaic pattern of low, moderate and high severity effects. These patterns were directly related to available fuels, terrain features, and the influence of local weather. The landscape areas can be used to visualize how the 2002 fires spread. The majority of the fire occurred in Steep/Dry landscapes, where stand replacing fires historically occurred. The Gentle/Moist and High Elevation landscape areas helped slow the spread of fire as it reached these areas, proving to be effective places to conduct suppression operations.

Some of late-successional stands in the planning area, which were mostly Fuel Model 10, burned at low to moderate intensity; many of the understory fuels were consumed and the overstory was left mostly intact. In these areas, surface fuels were only partially consumed. Where fire burned at higher intensities in forested stands, which occurred in much of Limpy Creek, most if not all of the ground fuel was consumed and most of the green trees were killed. The 2002 fires had a major effect on plantations; within the planning area, 38% of plantations experienced stand replacement mortality. High stand densities and low crowns allowed fire to burn rapidly through these stands.

Fire risk is the chance (probability) that a wildfire will start, either from natural or human causes, based on recent fire history. Fire hazard is determined by the characteristics of fuels combined with the influences of topography and weather. The fuels characteristics apply to both dead and live fuels, and include loading (tonnage), size and shape, compactness, horizontal continuity, vertical arrangement, fuel moisture content, and chemical properties. Topographic and weather influences, combined with fuels characteristics, determine the forward rate of spread of a fire and the intensity at which a fire will burn.

FIRE REGIMES: Fire regimes are comprised of patterns of fire frequency, intensity, severity, seasonality, predictability, and spatial patterns over time across landscapes (Agee 1993). Fire regimes define the role of fire as an ecosystem process. Over half of the Forest is mapped as Fire Regime III (mixed severity), although a significant change can be noted along the North-South Umpqua Divide as the forest transitions into a more frequent, lower severity fire regime as seen in Figure 16. For the Apple Fire, the majority of the area falls within Fire Regime III, which is characterized as a mixed severity regime. Within the planning area, the 2002 Apple Fire burned 210 acres of Fire Regime I, 119 acres of Fire Regime II, 6,759 acres of Fire Regime III, no acres in Fire Regime IV, and 2,711 acres of Fire Regime V (Figure 16).

The National Fire Plan and 10-year Comprehensive Strategy (USDI/USDA 2001) describe general wildfire risk by Condition Classes¹⁵. In Condition Class 1, fire regimes are within historical ranges and vegetation composition and structure are intact; there is a low risk of losing key ecosystem components from the occurrence of fire. In Condition Class 2, fire regimes have been altered from their historic range by either increased or decreased fire frequency; there is a moderate risk of losing key ecosystem components from the occurrence of fire. In Condition Class 3, fire regimes have been heavily altered and the risk of losing key ecosystem components is high; multiple fire return intervals have been missed. Most of the planning area falls within Condition Class 2, as at least one fire cycle has been missed.

¹⁵ The condition class identifies the departure of current conditions from the historical fire regime. There are three condition classes that categorize and describe vegetation composition and structure.

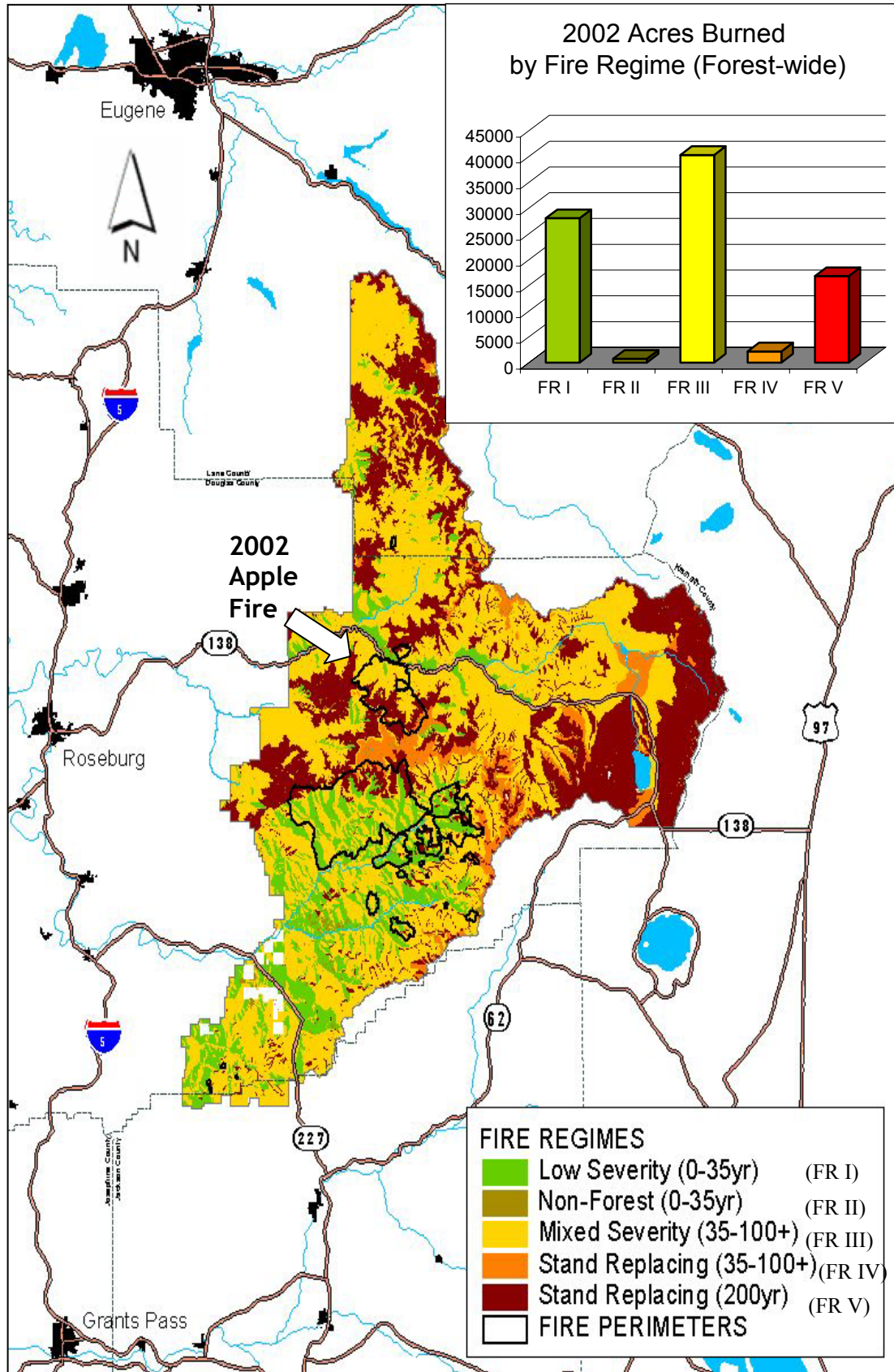


Figure 16. Umpqua National Forest Fire Regimes and 2002 Fire Perimeters.

FUEL LOADINGS - TRACKED AS A SIGNIFICANT ISSUE

The accumulation of fuel is an important consideration in predicting future fuel loads and fire hazards. Scoping identified that there would be a risk of leaving high fuel loads across the landscape, especially in areas that would not be salvaged. The indicators, or measures, selected to help assess the alternatives with respect to fuel loadings include the overall acreage of areas not salvaged and the potential for future wildfires to spread, as predicted by the model FARSITE. These indicators were selected because future fire behavior will be influenced by the amount, arrangement and continuity of fuels; this project would alter those factors. Future fire spread was selected because that indicator helps predict how the project would alter fire behavior in the future.

For this project, the snag fall and decay rate predictions were adopted from the Snagfall submodel of the SNFP (Sierra Nevada Forest Plan Amendment) Growth and Yield Model (Wilson, 1999). Decay of fallen material is also incorporated into this model. In addition, this model also predicts the potential number of snags that would remain standing in the future. The snag fall rates that this model calculates do not take into account different species, as this resolution of data was not available.

The model predicts that as the diameter of the tree increases, it takes longer for the snag to fall to the ground. According to the model, by year 25, approximately 94% of the trees that are in the 0"-10" size class will fall, over 80% of the 10"-16" size class, almost 60% of the 16" to 24" size class, over 40% of the 24"-40" size class, and about 30% of the over 40" size class. With respect to decay rates, as the diameter of the fallen material increases, it takes longer for that material to decay, leaving higher levels of coarse wood on the ground for a longer period of time. These assumptions were used in predicting snag fall rates and decay rates for the Baked Apple Fire Salvage area. Where salvage is proposed to occur, fuel accumulations would decline through harvest and decay until about year 25. At that point, the remaining standing snags begin to fall more rapidly, increasing fuels on the site. These assumptions, along with the use of the Fire Management Analyst (FMA) program, helped calculate the predicted tonnage of fuels in a forest stand. Fuels were addressed as 10-hour (0.25"-1"), 100-hour (1"-3"), and 1000-hour (>3") fuels. The 1-hour fuel loading (0-1/4") was omitted due to the high variability of accumulation over time. The FMA program does not include projected shrub and tree growth as these conditions could vary widely from area to area and depend on whether action is taken to replant areas or manipulate shrubs.

Also modeled in the SNFP Growth and Yield Model was the potential British Thermal Unit (BTU) output per square foot of ground. This provides a frame of reference in terms of the potential energy release that a given Fuel Model could be expected to produce from a future fire in the area. The estimated BTU production does not include the heat produced by standing dead fuels (snags) or shrubs. Values were found utilizing the BEHAVE fire behavior prediction system. Table 11 displays the predicted amount of BTU output by Fuel Model.

Table 11. BTU/ft² Produced by Fuel Model (90th Percentile Weather)

Fuel Model	BTU/ft ²
8 (conditions that existed pre-fire)	209
10 (conditions that existed pre-fire)	1,411
11 (conditions that exist post-fire)	803
12 (conditions that exist post-fire)	2,385

Affected Environment

Fuel Loads Within the Planning Area

Observations in the 1996 Spring Fire and a down wood inventory in the 2002 Apple Fire provide examples of how fuels change in forested stands over time and in response to fire intensity. Based on the Spring Fire, forested stands that experienced moderate and high intensity fire would have enough small fuels present after seven years to carry a fire again. Heavy fuels continue to accumulate in these stands as snags fragment and fall to the forest floor, but it is predicted that it would take decades for green trees to dominate these stand-replacement fire areas. Figures 17 and 18 are examples of the concentrations of snags present in some areas of the 1996 Spring Fire (about 12 air miles to the northeast) and demonstrate the potential surface fuel deposition that can be expected in the Apple Fire area after the snags begin to fall.



Figures 17 and 18. Snag fall that has occurred in the seven years since the 1996 Spring Fire.

In the high intensity burn areas within the planning area, the surface fuel loading is almost non-existent due to the intensity of the fire, as shown in Figure 19. The duff layer is completely consumed and little effective ground cover remains.



Figure 19. Baked Apple Unit 89; this stand experienced 100% tree mortality and complete consumption of the 1, 10, and 100 hour fuels. The light colored surface consists of Douglas-fir needle cast.

Figures 20 and 21 are typical of the concentrations of snags present in some parts of the planning area and demonstrate the potential surface fuel deposition after the snags begin to fall.



Figure 20. Baked Apple Unit 15.

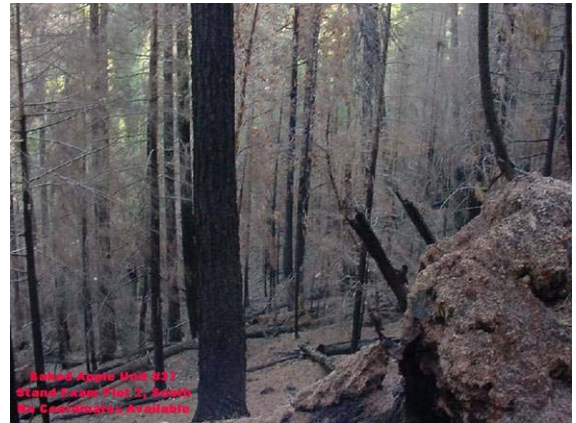


Figure 21. Baked Apple Unit 37.

Fire Behavior

Fire behavior is a function of weather, topography, slope and fuels. The North Umpqua River corridor functions as a channel for wind and provides the optimum conditions for high intensity fires, especially when combined with the steep dissected terrain and southerly exposures. Those areas that are not on a southerly exposure are subject to winds within the corridor. The winds are typically up canyon during the day and down canyon at night. When a high-pressure system on the east side of the Cascade Range and a low pressure system along the coast exist, conditions for strong east wind event within the river corridor are probable (USDA 2001). These wind events dry out fuels and if an

ignition source exists, the dried fuels and strong winds can produce intense fire behavior. During the 2002 Apple Fire the combination of dry, high fuel loads, an unstable atmosphere and hot weather conditions combined to create a plume-driven fire event, in which the convection column drove the fire and produced its own wind drafts as seen in Figure 22.



Figure 22. The 2002 Apple Fire Smoke Column (August).

Once the fire started, strong winds and high daytime temperatures combined to carry the fire into the preheated fuels, contributing to high intensity burns that made rapid fire runs up slope and sometimes up the drainage, a phenomenon seen in the 1987 Apple Fire. This phenomenon helps explain some of the large patches of high intensity fire areas that occurred in the 2002 Apple Fire, as seen in Figure 23.

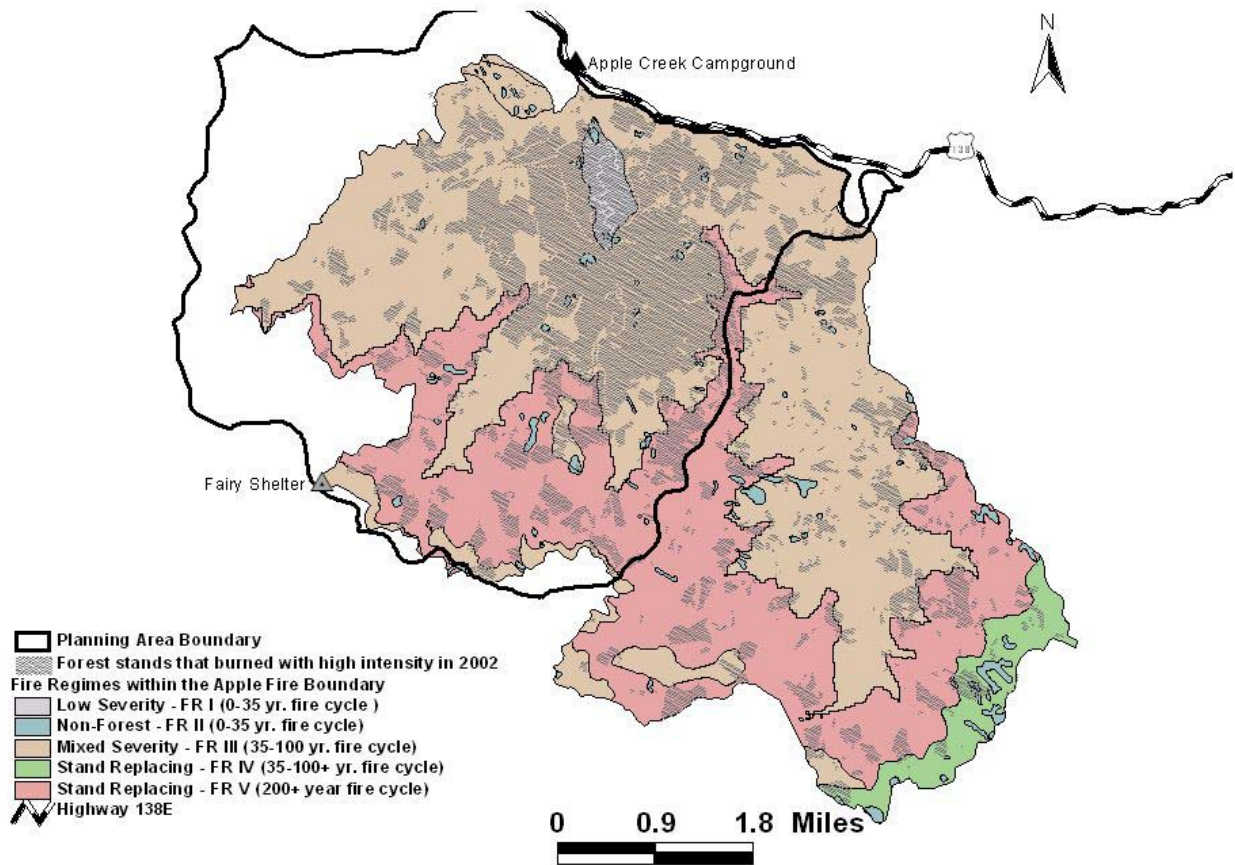


Figure 23. Fire Regimes in the Apple Fire. The areas that burned intensely are shown in gray. The majority of the stand replacement fire area occurred within the mixed severity and high severity fire regimes.

Fire behavior is expressed in terms of flame lengths, rates of spread, and fireline intensity associated with the Fuel Model.

Flame Length: A flame length of 4 feet is generally considered the upper limit for direct action taken by hand crews and 6 feet is considered the upper limit for direct action taken by mechanized equipment (dozers). Flame lengths in excess of these limits usually result in indirect action taken to contain the fire.

Rate of Spread: The rate that a fire spreads is dependant on the amount, arrangement and continuity of the fuels, weather, and topography. For Fuel Model 11, the fire can spread from 1-11 chains per hour, on 40% slope or less. For Fuel Model 12 on less than 40% slope, fires can spread 6-17 chains per hour. The faster a fire spreads, the more difficult it is for ground suppression forces to attack the fire directly.

Fireline Intensity: Fireline intensity is the amount of heat released at the flaming front of a fire expressed in British thermal units per foot per second (btu/ft²/sec). Intensities in excess of 100 btu/ft²/sec are generally considered too hot for direct action by personnel. Fireline intensities greater than 500 btu/ft²/sec are considered too hot for direct action by mechanized equipment.

Resistance to control is described by the use of a subjective rating using the U.S. Forest Service Manual 5151.14-2, Resistance to Control Calculation Matrix.

Resistance to Control: Resistance to control is generally viewed as an estimate of the suppression force required to control a unit of fire perimeter. For example, “High” resistance to control means “slow work for dozers, very difficult for hand crews; hand line holding will be difficult.” The U.S. Forest Service Region 5 developed a resistance to control rating scheme based on difficulty of hand line construction and an inventory of downed woody fuel loading by size class. That rating system is adopted here. High and extreme ratings, as shown in Table 12, were reached for the following loadings, as measured in tons/acre of fuel:

Table 12. Resistance to Control Ratings, by Fuel Loading (tons/acre).

0 to 3 inch diameter fuels	3 to 9 inch diameter fuels	Rating (reflects total fuel loading of 0 to 9 inch fuels)
5 tons per acre	25 tons per acre	High
10 tons per acre	15 tons per acre	High
15 tons per acre	5 tons per acre	High
5 tons per acre	40 tons per acre	Extreme
10 tons per acre	25 tons per acre	Extreme
15 tons per acre	15 tons per acre	Extreme

Presence of pieces greater than a 9-inch diameter reduces the above loading necessary to reach high and extreme rating. The number of large pieces (>9 inches) is more important than their loading in determining resistance to control (Brown et al 2001).

Understanding the fire regimes under which the 2002 Apple Fire burned and the patterns and densities of fuels that it left in its wake helps predict potential surface fuel deposition that is expected to occur over time as the snags begin to fall. This knowledge helps facilitate fire behavior predictions. These descriptions also aid in predicting the potential number of down logs and other large material that will be deposited on the surface over time, which influences potential future fire intensity, resistance to control predictions, and the ability to suppress the fire.

Fire and Fuels: Environmental Consequences

Alternative 1

Direct Effects

In many areas surface fuels were consumed by the fire and are negligible. By year 1 or 2, any needles on the trees killed by the fire would drop, but would not present a fire hazard due to the lack of other surface fuels. For a fire occurring over the next 1 to 2 years, fire behavior would be minimal in terms of flame length and fireline intensity due the lack of current surface fuels in the burned area. As time passes the number of snags falling would increasingly contribute to the surface fuels present in the project area. Where fires burned at low to moderate intensity in late-successional stands (and green trees still

exist), fuel loads are expected to build to pre-fire levels quickly as mortality in the understory begins to occur. Fuels would continue to build until reduced by fuels reduction activities or another fire occurs.

Alternative 1 would not reduce future fuel loads and thereby would not reduce the intensity of future fires that may occur in the same place. Alternative 1 would also not facilitate the removal of dead trees that may help slow the buildup of insect populations of bark beetles and woodborers (Amman and Ryan 1991; Simon et al. 1994).

Where stand replacing fire occurred, fuel loadings are predicted to build toward pre-fire levels more slowly, as much of the original surface biomass was consumed. Smaller fuels would dominate the forest floor until trees begin to shed larger branches and portions of the trunks begin to weaken and fall.

As fuels accumulate, the fuel sizes, loading (tonnage), compactness, horizontal continuity, and vertical arrangement would pose a high fire hazard or contribute to conditions that would inhibit or preclude safe firefighting practices. Under the no action alternative, existing fuel loads range from a low of 318 tons per acre to a high of 726 tons per acre (both standing and down wood). Immediately after the fire, the area became a Fuel Model 8 (Figure 24), similar in fuel loading to the unburned stand shown below. A Fuel Model 8 is expected to produce about 209 BTU/ft² if another fire was to occur.



Figure 24. Fuel Model 8 in an unburned stand.

Indirect Effects

The results of modeling efforts are presented in Table 13 in terms of tons per acre in each of the fuel size classes at year 5, 10, 15 and 25, and the projected snags per acre expected to be standing in that particular year. Representative stands were used to display predicted fuel loads; ranges of future fuel loads are an issue indicator as described in Chapter 1. Additional stands were also modeled; these results are found in the Project Record.

Table 13. Alternative 1: Potential fuel accumulations (tons/acre) and remaining snags/acre.

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	4.20	3.62	56.99	102	5	1.04	1.51	38.79	74
10	6.11	7.16	88.22	84	10	1.62	2.38	66.59	56
15	8.30	8.44	102.40	66	15	1.92	2.85	86.64	44
25	10.11	9.03	139.11	39	25	2.07	3.15	111.31	28

Table 13 demonstrates the buildup of fuels over time primarily through snag fall. The initial rapid buildup of the 1,000-hour fuels (>3" diameter) up to year 5 is indicative of the generally large number of small (< 10" dbh) snags. By year 5 most of the areas would be in a condition, relative to surface fuels, that could be described by varying degrees of the Fuel Model 11 (Figure 25). For Fuel Model 11, it is expected that a future fire would be fairly active in the concentrations of down wood and herbaceous material that is intermixed. However, the spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential.

Shrub growth is likely to be extensive under the no action alternative, as regeneration efforts would only occur as appropriated funds are secured. Shrub growth within the first 5 years would tend to slightly dampen the predicted fire indices (flame length, rate of spread, and fireline intensity) due to considerably higher fuel moistures than similar-sized dead fuels. This dampening effect would tend to increase as shrub growth increases for approximately 20 to 40 years until shrub decadence and the higher fuel moistures in the live portions of the shrubs reaches some equilibrium. After that point the dampening effect subsides as the shrubs become more available as part of the overall fuel bed.

Based on fire history as discussed above, another fire in the project area is quite likely within the next 25 to 50 years. In the event of another fire, the fuel buildup as a consequence of Alternative 1 would affect fire behavior and resistance to control.

The following photographs and tables depict the surface fuel conditions described in Fuel Model 11, the potential fire behavior of the condition and the estimated resistance to control. Additional photos of the fuel models (for low and high) are available in the Fuels Report, located in the Project Record. The fire behavior predictions were based on the BEHAVE Fire Behavior Prediction¹⁶ program, which is described in detail in the Fuels Report, located in the Project Record.

¹⁶ The program uses the 10 and 100 hour surface fuels (1/4 to 3 inch fuels) predicted to be present, the 90th percentile weather for the area, 5 slope classes and 3 validated variations of the Fuel Model (Low, Medium and High). Standard FBPS Fuel Models 11 and 12 were used for the "medium" category. The "low" and "high" Fuel Models 11 and 12 were derived from the standard FBPS Fuel Models by reducing or increasing the fuel bed bulk depth and changing the fuel loading in a manner that preserved the surface area to volume ratio for the fuel bed. The 90th percentile weather conditions are standard weather parameters used for modeling on the Umpqua National Forest and are as follows: 1-hour fuel moisture = 4%; 10-hour fuel moisture = 6%; 100-hour fuel moisture = 9%; 1000-hour fuel moisture = 12%; 20-foot wind speed = 5 mph; live herbaceous fuel moisture = 37%; and live woody fuel moisture = 80%.

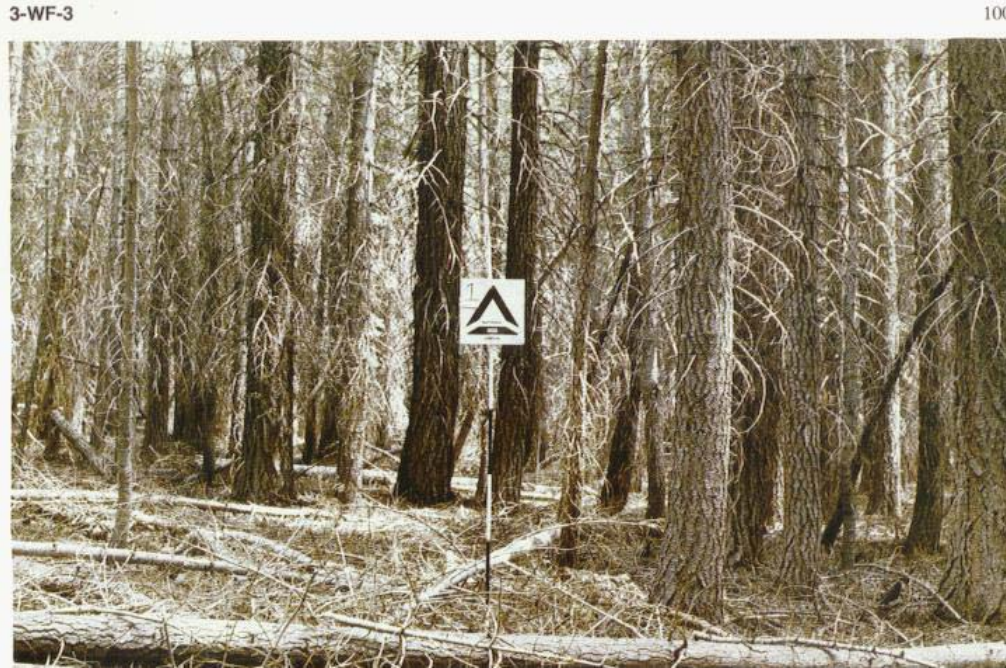


Figure 25. Fuel Model 11 (PSW-56/30WF-3, Medium FBPS Model 11).

Table 14. Fire Behavior Associated with the 3 Variations of Fuel Model 11.

Behavior parameter	Variation	0% slope	10% slope	20% slope	30% slope	40% slope
Flame Length (ft.)	L	1-2	1-2	1-2	1-2	1-2
	M	3-4	3-4	3-4	3-4	3-4
	H	4-5	4-5	4-5	4-5	5-6
Rate of Spread (chains/hr.)	L	1-2	1-2	1-2	2	2-3
	M	5-6	5-6	5-6	5-6	6-7
	H	7-8	8-9	8-9	9-10	10-11
Fireline Intensity (btu/ft ² /sec)	L	8	8	9	10	11
	M	66	68	72	80	91
	H	144	148	157	174	197
Resistance to Control	L	Medium	Medium	Medium	Medium	Medium
	M	Medium	Medium	Medium	Medium	Medium
	H	High	High	High	High	High

Over the next 5 to 25 years, the majority of the surface fuel contribution is from the larger size classes as they begin to fall. The slowing in the rate of increase in the 10 and 100-hour fuels is due primarily to their more rapid decay in comparison to the 1000-hour fuels and the slower fall down rate of the larger trees after the smaller trees have mostly

fallen. Snag fall in the various size classes generally follows a curve with the primary factors being the number of years after mortality and the snag fall rate for the size class.

Within 25 years, snag fall and down wood accumulation would move the area into a Fuel Model 12, which would be expected to release about 2,385 BTU/ft² of energy from a future fire in the area. It is expected that 284 to 485 tons per acre of fuels would accumulate (with some fuels deteriorating due to decomposition), influencing future fire behavior and the ability of fire suppression personnel to effectively and safely suppress a fire. For Fuel Model 12, rapidly spreading fires with high intensities capable of generating spot fires (fires that are ahead of the main fire and are started by burning embers that are carried by the wind) can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered (Anderson 1982). Fire behavior in a fuel model 12 can be expected to exhibit greater intensities, greater than four foot flame lengths, leading to potential fire control difficulties. The following photographs and tables depict the surface fuel conditions described for Fuel Model 12 and the potential fire behavior of the condition; additional pictures of the low and medium Fuel Model 12 can be found in the Project Record. The fire behavior predictions were again based on the BEHAVE Fire Behavior Prediction program as described above.



Figure 26. Fuel Model 12 (INT-98/Stand 23a, High FBPS Model 12).

Table 15. Fire Behavior Associated with the 3 Variations of Fuel Model 12.

Behavior parameter	Variation	0% slope	10% slope	20% slope	30% slope	40% slope
Flame Length (ft.)	L	5-6	5-6	5-6	5-6	5-6
	M	7-8	7-8	7-8	8-9	8-9
	H	8-9	8-9	8-9	9-10	9-10
Rate of Spread (chains/hr.)	L	6-7	7-8	7-8	8-9	9-10
	M	10-11	10-11	11-12	12-13	14-15
	H	12	12-13	13-14	14-15	16-17
Fireline Intensity (btu/ft ² /sec)	L	193	197	211	234	266
	M	436	446	477	529	602
	H	583	596	638	708	805
Resistance to Control	L	High	High	High	High	High
	M	Extreme	Extreme	Extreme	Extreme	Extreme
	H	Extreme	Extreme	Extreme	Extreme	Extreme

Overall, under Alternative 1, resistance to control in years 1 and 2 would be minimal, from years 3 to 5 it would range from medium to high and after year 5 would range from medium to extreme. In the event of a future fire, the flame lengths and fireline intensity associated with Fuel Model 12 would preclude direct attack by handcrews or dozers. The fire's rate of spread would exceed the production capability of a handcrew. Indirect attack, where fire lines are constructed away from the fire, generally on ridges or along roads would be required. Indirect attack results in larger fires, since the unburned area between the main fire and the fireline is intentionally burned in advance of the wildfire to eliminate fuel.

The number of snags present would potentially preclude nighttime operations, normally the time when fire behavior is minimal and good progress on suppression activities may be conducted. In areas of numerous snags, ground suppression efforts may be precluded altogether.

A deterministic fire growth model (FARSITE, as described by Finney 1998) was utilized to model the potential growth and effects of future wildfire and prescribed fire upon the landscape in future years; future wildfire growth is an issue indicator as described in Chapter 1. FARSITE is a graphically displayed computer model. It utilizes GIS (Geographic Information System) and the BEHAVE fire behavior prediction system to display these effects.

A control scenario was run under the conditions of the first burning period (10:00 am till 6:00 pm), and is represented by the yellow line in Figure 27 for the Apple Fire. The purpose was to calibrate the model using the original conditions (fuels, weather, and topography) that existed during the first burning period of the 2002 Apple Fire. Once the calibration matched the approximate perimeter of the first burning period, the model was run to predict fire spread, with a possible ignition point along a main road.

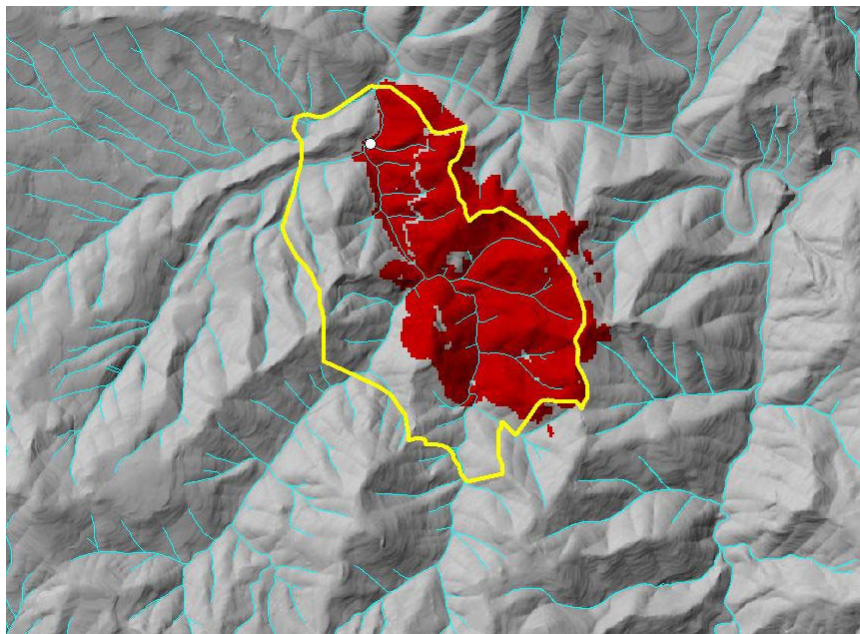


Figure 27. Calibration of FARSITE Model, with Logical Human Caused Ignition Point.

No suppression action or their effects are demonstrated. The model was run with the conditions predicted at 25 years with fuel conditions derived from the same snag fall down rates mentioned previously. Future stand growth and development, canopy closure and height to crown base were also modeled.¹⁷ This FARSITE analysis predicts the size of a future fire in the area in 25 years, based on no action.

After examining the fall down rates and the results of the stand growth model, the existing condition of the no action alternative showed the area would be represented by a fuel model 12 with an overstory of mixed conifers; trees would be about 25 feet tall and the base of their crowns would be at least 8 feet off of the ground. These parameters were used in the FARSITE model to show the effects of fire, 25 years in the future as represented by Figure 28.

Predicted Future Fire Behavior Under Alternative 1

Figure 28 demonstrates that significant fire spread would occur in the event of a future fire under the no action alternative. Within the first 8 hours of ignition, it is predicted that a fire would burn about 1579 acres (Figure 28).

¹⁷Stand growth was modeled using the Suppose version 1.16 of the Forest Vegetation Simulator, Western Cascades Variant version 6.21. FARSITE has been verified in the field, using prescribed natural fires in Yosemite and Glacier National Parks (Finney 1998).

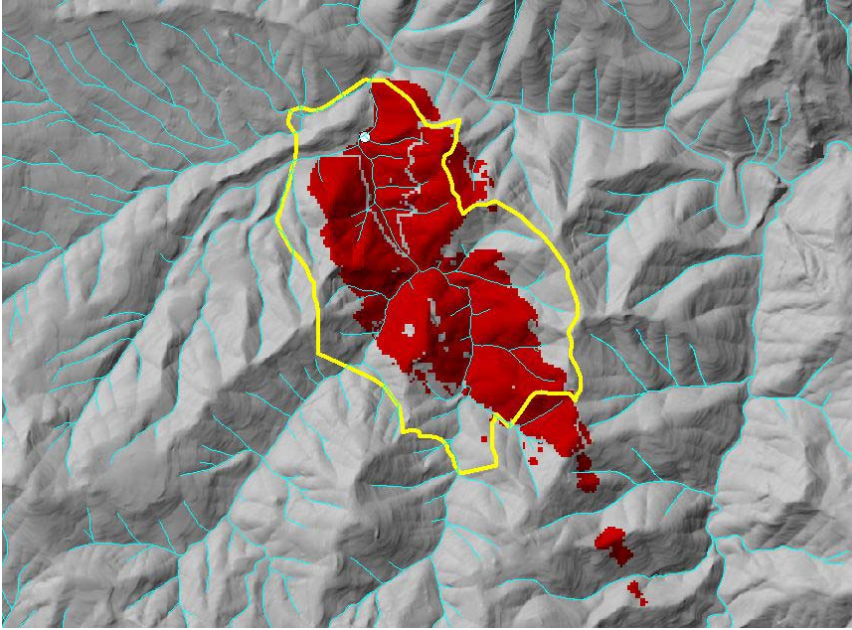


Figure 28. FARSITE Prediction for Alternative 1.

Under Alternative 1, the 2002 Apple Fire landscape would eventually become an area in which fire suppression activities would be difficult and hazardous. The likely scenario in the future would be to manage fires within the 2002 Apple Fire perimeter by retreating to ridge tops outside the fire perimeter and conducting suppression activities indirectly. The presence of numerous snags in the area would also contribute greatly to a decision to use indirect attack techniques to protect firefighters from falling snags. Alternative 1 would serve to compound fire suppression difficulties in the area as a whole.

In general, the amount of fuel does not affect the probability of reburn or wildland fire ignitions. The meteorological and physical processes that generate lightning, and human behavior that leads to human-caused fires, determine when and where a fire ignition occurs. The real question is not whether there is a greater probability for reburn, but when reburns occur would they be of greater intensity and more destructive to natural resources (Everett 1995). Professional experience has shown that increased fuel loads can result in increased fire intensity and severity. In other words, given the same weather and topographic conditions, areas with higher fuel loads would burn hotter, have longer flame lengths, have greater potential to convert to crown fires, be more difficult to contain, pose greater risks to firefighters, kill more vegetation, and damage soils more severely than areas with lower fuel loads. The literature shows that when dead and live tree biomass increase, so does flame length and fireline intensity (Rothermal 1983) and while large woody fuels have little influence on the spread of the initiating fire, they can contribute to development of large fires and high fire intensity and severity (Brown, et al 2001), especially where fuel loads are continuous.

Alternative 1 has the potential to lead to additional large-scale fires across the landscape. The FARSITE model predicts that approximately 1579 acres would be consumed in a future fire during the first burning period (Figure 29), most of which would be expected to be high intensity.

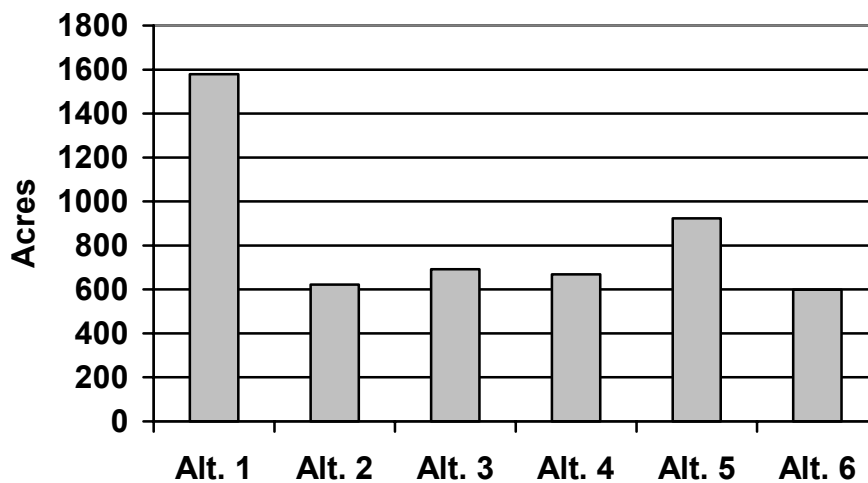


Figure 29. Predicted FARSITE Acres of Fire Spread in 25 Years.

The Late-successional Reserve (LSR) to the southeast of the planning area (east of Calf Ridge) would be at risk, as a future fire under Alternative 1 would extend well into the LSR and would likely reburn areas burned in 2002. A future fire would potentially reduce habitat and negatively affect the integrity and continuity of the LSR. Predicted fire behavior under the model shows that spotting may occur over ½ mile away. Any regeneration that occurs in the LSR may potentially be consumed.

For future forest management options, Alternative 1 would complicate the reintroduction of fire as a tool to manage fuel loading and to meet ecological goals in the future. Prescribed fire in areas of high fuel loading risks escape, killing growing trees and would require costly preparation and numerous entries to be successful. Alternative 1 would not contribute to the effectiveness of prescribed burning or other potential future projects to improve forest health, desired vegetation conditions, fire resilience or suppression effectiveness across the landscape.

Action Alternatives

All action alternatives would have these fuel reduction objectives, based on current Umpqua National Forest Policy:

- Treat activity-created fuels other than units designated for no treatment, to the level stated below.
- Retain effective ground cover, large woody component and snags within treated units to levels prescribed.
- Maintain air quality standards. Comply with Oregon state smoke management regulations.

Activity-created fuels would be reduced according to the following guidelines¹⁸:

0" - ¼" fuels (1 hour fuels)	= <1 ton per acre
¼" - 3" fuels (10 and 100 hour fuels)	= 4-8 tons per acre
3" - 9" fuels (1000 hour fuels)	= 7-12 tons per acre
Total activity-generated fuels:	= 12-21 tons per acre

For a fire occurring over the next 1 to 2 years, fire behavior would be minimal in terms of flame length and fireline intensity due the lack of current surface fuels in the burned area. By year 5 most of the salvage areas proposed for treatment would be in a condition, relative to surface fuels, that could be described by varying degrees of the fuel model 11. For fuel model 11, it is expected that a future fire would be fairly active in the concentrations of down wood and herbaceous material that is intermixed. However, the spacing of the rather light fuel load, shading from overstory, or the decay of the fine fuels can contribute to limiting the fire potential. See Figure 25 and Table 14 associated with Fuel Model 11, as described previously.

Alternative 2

Direct Effects

With implementation of Alternative 2 and the associated fuels treatments, the surface fuels present within the proposed harvest units would consist of approximate tonnages in each of the size classes, as described in Table 16, not including large material (down logs) left on site for wildlife, watershed and silvicultural purposes. After activity fuels treatment, harvest units would convert to a fuel model 11 as described above. The burned areas outside the proposed harvest units would be represented by a fuel model 12, as described in Alternative 1. The treatment of fuels within harvest units would break up the continuity and arrangement of fuels upon the landscape, giving fire managers more suppression options, should a future fire occur.

A low intensity fire, (less than two foot flame lengths) would be expected in areas that support a fuel model 11. Fuel model 11 can be expected to exhibit slow burning ground fires. Fuel model 11, distributed as evenly as practical, would provide sufficient ground cover for soil protection purposes. Snags left standing for old forest structure, wildlife, watershed and silvicultural purposes would be distributed evenly, decreasing the hazard to firefighters. In addition this arrangement would provide opportunities for future prescribed burning in the area, should it occur. Alternative 2 would be expected to have the following residual fuels after harvest and activity-generated fuels treatments (Table 16) and would meet current Forest goals for hazardous fuels reduction.

Table 16. Average residual fuel tonnage for Alternative 2.

10 hour fuels (1/4" to 1")	1.6 tons per acre
100 hour fuels (1" to 3")	2.6 tons per acre
1000 hour fuels (3" to 9")	16.6 tons per acre

¹⁸ Fuel profile standard from the Umpqua National Forest Hazard Reduction Guidelines.

Indirect Effects

The expected accumulation of fuel and the potential fire effects over the next 25 years has been modeled by the same methods described for Alternative 1. The results of this modeling are presented in Table 17. The table does not contain descriptions of all distinct areas within the project area, but demonstrates the range of conditions that are predicted to exist.

Table 17. Alternative 2: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre (after 2 snags are felled for soil productivity).

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	1.75	2.39	17.13	9	5	1.65	1.46	9.92	9
10	1.32	1.82	13.88	8	10	1.42	1.62	11.01	8
15	1.21	1.69	10.14	7	15	1.25	1.85	12.30	7
25	1.98	2.66	15.63	5	25	1.94	2.52	15.92	5

The preceding table demonstrates the decay of surface fuels and snag retention over time. Over time, snag fall accumulations overtake decay rates, resulting in a build up of fuels. This fuel build up is accentuated by year 25, especially where a large number of snags are retained. However, the fire behavior associated with these conditions remains minimal due to treatment and the decay of surface fuels. By year 5 most of the areas would remain in a condition, relative to surface fuels, that could be described by a “low” FBPS fuel model 11. Due to the relatively slow accumulation of surface fuels from the remaining snags the area would likely fit into the fuel model 11 definition, for up to 20 or more years. This type of fire behavior, in terms of flame length and fireline intensity, would enable direct attack to be taken on a fire by hand crews.

Most of the snags left would be evenly distributed throughout the area and in addition to the relatively mild fire behavior predicted; the frequency of snags would permit safer nighttime fireline operations. Resistance to control falls into the “medium” category in most areas under Alternative 2.

Under Alternative 2, shrub growth would be less than what is expected to occur under No Action, as reforestation would occur on about 957 acres, with an additional 600 acres planted along intensely burned riparian areas. As stated in Alternative 1, shrub growth within the first 5 years would tend to slightly dampen the predicted fire indices (flame length, rate of spread, and fireline intensity) due to considerably higher fuel moistures than similar-sized dead fuels, until the shrubs matured and decayed. The reforestation prescription of planting on a 10 foot by 10 foot spacing (riparian areas would be planted at 14 feet X 14 feet), with 30% to 40% mortality expected would create stands that are fairly open. A future fire in these stands would not burn as rapidly as what occurred during 2002, as stand densities would be less.

Fire behavior would also be influenced by the condition of adjacent stands and by the remaining surface fuels and snags. Currently, there are no published studies that have examined how post fire salvage logging alters the size distribution of fuels and the resulting future fire hazard. Studies on fuels left after harvesting green trees suggests that post fire logging may increase short term fuel loads and the fire risk, due to increased fine activity fuels. This short-term increase is followed by a reduced intermediate and long term fire risk through removal of larger, dead fuels (Brown 1980). After a fire, the fine fuels would remain in adjacent stands, potentially increasing the risk of future fires.

As depicted in Figure 30, a fire simulated after implementing Alternative 2 would burn about 622 acres during the first burning period. This is a 61% reduction in predicted acres burned than what occurs under the No Action Alternative.

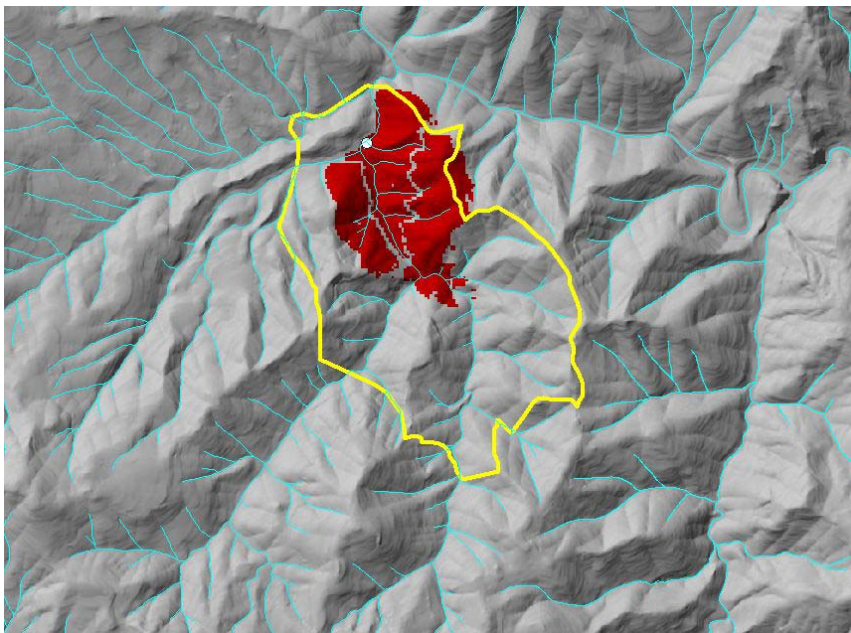


Figure 30. FARSITE Prediction for Alternative 2.

Alternative 3

Direct Effects

This alternative differs from the proposed action by further focusing on maintaining soil productivity while reducing the potential of sedimentation. Additional logging slash is left on-site to provide effective ground cover and reduce the potential for surface erosion. Less underburning is used to treat slash in this alternative in order to maintain high levels of effective ground cover. Because of this, Alternative 3 would retain higher fuel load, which may lessen the opportunity to reintroduce fire in the future. However, Alternative 3 still serves to reduce fuel loadings and fire suppression difficulties in the area as a whole.

After implementation of Alternative 3 the surface fuels present following salvage would consist of the following approximate tonnage in each of the size classes, not including

large material (down logs) left on site for wildlife or watershed purposes (Table 18). This would meet current Forest goals for hazardous fuels reduction.

Table 18. Average residual fuel tonnage for Alternative 3.

10 hour fuels (1/4" to 1")	1.8 tons per acre
100 hour fuels (1" to 3")	2.1 tons per acre
1000 hour fuels (3" to 9")	16.1 tons per acre

A direct effect of this alternative is that it distributes residual fuels as evenly as practical, providing sufficient ground cover (80% to 100%) for soil protection purposes. The residual tonnage is still low enough so that the accumulation of additional surface fuels from the predicted snag fall would not present a large fuel buildup or contribute to fire suppression difficulties in the short term (1 to 6 years).

The fire behavior associated with the conditions present during the first 25 years would be minimal in terms of fireline intensity, flame length, and rate of spread and could be described by a "low" or "medium" FBPS fuel model 11 (Figure 25 and Table 14). This type of fire behavior, in terms of flame length and fireline intensity, would enable initial action to be taken on a fire by hand crews. The numerous snags likely to be present throughout the area may, however, inhibit or preclude safe nighttime operations. Fire behavior in adjacent stands would be similar to what was described under Alternative 2.

Indirect Effects

The indirect effects of Alternative 3 would, in terms of fireline intensity and flame lengths, enable effective fire suppression action to be conducted for the first 25 years. Although the fire behavior would be conducive to suppression action, the risk from retaining numerous snags would be considerable and factor heavily into whether a future fire could be directly or indirectly suppressed.

The accumulation of fuels over the next 25 years has been modeled by the same method as described for Alternative 1. Table 19 shows how snag fall rates overtake the decay rates of surface fuels at year 25. The relatively small increase in surface fuels between years 15 and 25 is due to the residual snags falling that are greater than 20" dbh.

Table 19. Alternative 3: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre (after 2 snags are felled for soil productivity).

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	1.62	2.39	16.77	4	5	1.99	3.01	17.13	14
10	1.11	1.71	10.94	4	10	1.42	2.11	12.22	13
15	0.97	1.20	8.21	3	15	1.29	1.63	10.87	12
25	1.82	2.52	12.03	3	25	1.88	2.53	14.69	11

Table 19 again demonstrates the long-term increase in surface fuels as time passes. The model shows an increase in fuels after year 5; this is primarily due to snag-fall in the small diameter trees. Under Alternative 3, shrub growth would be less than what is expected to occur under No Action, as reforestation would occur on about 770 acres, with an additional 600 acres planted along intensely burned riparian areas. The effects of shrub growth and reforestation would be similar to that described under Alternative 2, although almost 200 fewer acres would be reforested. In those areas, effects similar to those described under Alternative 1 would occur.

As depicted in Figure 31, a fire simulated after implementing Alternative 3 would burn about 692 acres during the first burning period. This is a 57% reduction in predicted acres burned than what is predicted under the No Action Alternative, and is slightly more acres than what would burn under Alternative 2.

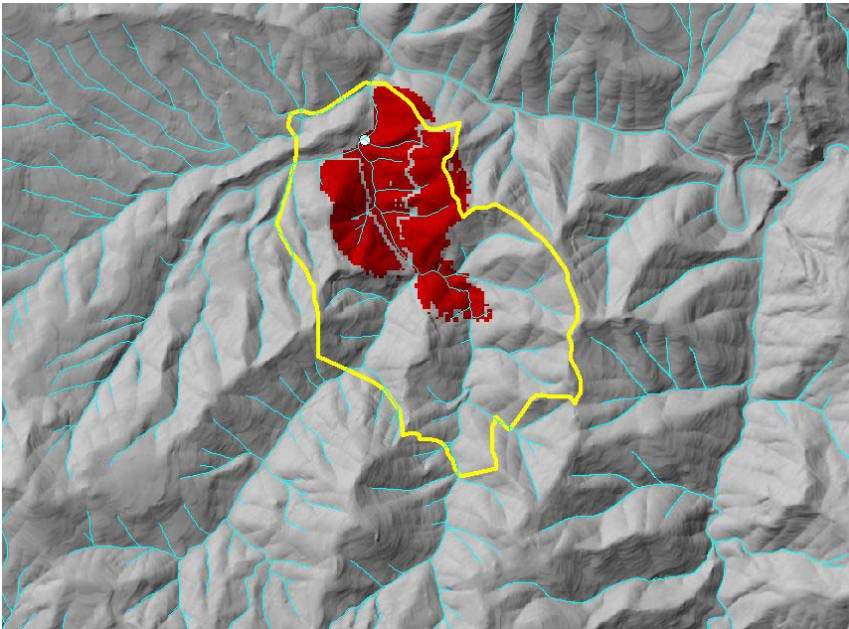


Figure 31. FARSITE Prediction for Alternative 3.

Alternative 4

Direct Effects

This alternative differs from the proposed action by focusing on maximizing economic efficiency while still meeting resource objectives. To address fuels concerns, a prescription was developed for portions of riparian reserves adjacent to harvest units, which would slow fire spread as described in Chapter 2.

After implementation of Alternative 4 the surface fuels present within harvest units would consist of the following approximate tonnage in each of the size classes (Table 20), not including large material (downed logs) left on site for wildlife or watershed purposes. This would meet current Forest goals for hazardous fuels reduction.

Table 20. Average residual tonnage for Alternative 4.

10 hour fuels (1/4" to 1")	1.1 tons per acre
100 hour fuels (1" to 3")	1.3 tons per acre
1000 hour fuels (3" to 9")	14.1 tons per acre

After fuels treatment, a direct effect from this alternative would be a significant reduction in surface fuels, creating a condition in the harvest units that would resemble those found in a Fuel Model 11, as described under Alternative 2. The direct effects to fuel loads and fire behavior within the harvest units would also be the same as Alternative 2. A direct effect of this alternative is a reduction in fuel loads along roads; there is also a slight reduction in fuels in the outer portions of the 32 acres that would be salvaged and in the 202 acres that would have fuels treated in the Riparian Reserves. This reduction in fuel loads would lessen future fire behavior in these areas, resulting in greater flexibility in future fire suppression options and increased firefighter safety, compared to the other alternatives.

Indirect Effects

In the majority of harvest units, the dead trees left after harvest would have little indirect effects on fuels build up from 5 to 25 years. The areas not treated in the Riparian Reserves, however, would contribute to existing fuel loads. Table 21 displays the fuel accumulations over time, as a result of implementing Alternative 4.

Table 21. Alternative 4: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre (after 2 snags are felled for soil productivity).

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	2.17	2.90	19.07	6	5	1.39	2.03	14.66	5
10	1.40	1.87	12.33	5	10	1.20	1.72	11.02	5
15	1.19	1.59	10.49	5	15	1.12	1.68	9.88	4
25	1.56	2.08	13.70	4	25	1.73	2.33	13.92	3

Table 21 shows the buildup of fuels over time, similar to that displayed for Alternatives 2 and 3. Where fewer trees are retained, fuel loads would be less in the future. Under Alternative 4, shrub growth would be less than what is expected to occur under No Action, as reforestation would occur on about 951 acres, with an additional 600 acres planted along intensely burned riparian areas. The effects of shrub growth and reforestation would be similar to that described under Alternative 2.

As depicted in Figure 32, a fire simulated after implementing Alternative 4 would burn about 669 acres during the first burning period; eliminating the unsuitable soils from salvage (a change between draft and final) would result in more fuels available for burning in the future. This would result in a slightly higher prediction of acres burned. This is approximately a 58% reduction in predicted acres burned than what occurs under the No Action Alternative, and burns slightly more acres than what burns under Alternative 2.

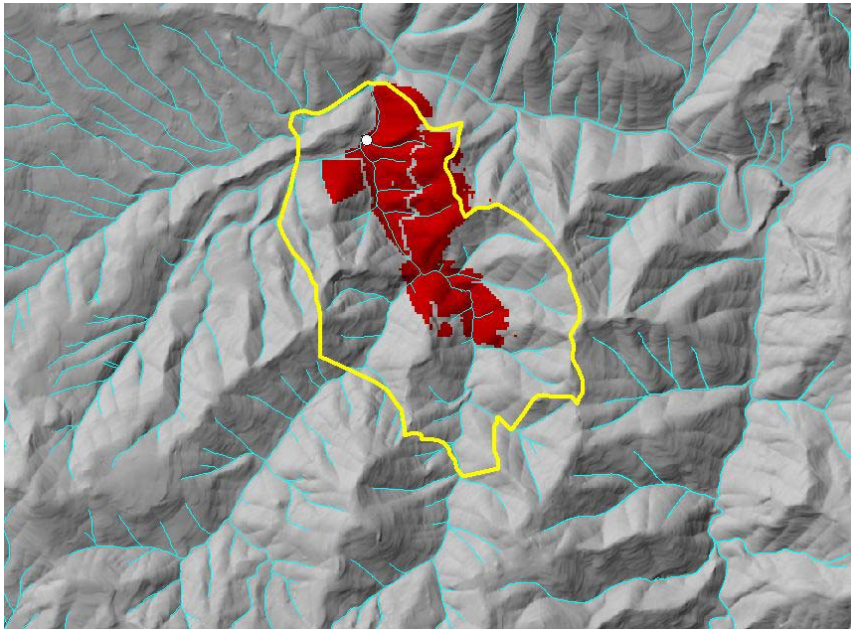


Figure 32. FARSITE Prediction for Alternative 4.

Alternative 5

Direct Effects

Alternative 5 follows recommendations set forth in “Recommendations for Ecologically Sound Post-Fire Salvage Management and Other Post-Fire Treatments on Federal Lands in the West” (Beschta et al. 1995). This alternative retains the most snags of all of the action alternatives.

All harvest units would receive post harvest fuels treatments either by hand or grapple piling. After completion of Alternative 5 the surface fuels present would consist of the following approximate tonnage in each of the size classes, not including large material (downed logs) left on site for wildlife or watershed purposes (Table 22):

Table 22. Average Residual Tonnage for Alternative 5.

10 hour fuels (1/4" to 1")	1.3 tons per acre
100 hour fuels (1" to 3")	2.2 tons per acre
1000 hour fuels (3" to 9")	7.7 tons per acre

The lower post harvest fuel loadings associated with this alternative as described in Table 22 are due to lower amounts of volume being removed, which would create less activity-generated fuels. Forest plan goals for activity generated fuels would be met. The initial fuel loadings within harvest units after fuels treatment would be represented by fuel model 11. Areas not harvested and treated would be represented by conditions stated in Alternative 1.

The direct effect of implementing Alternative 5 would be a short-term reduction in surface fuel loads over the 220 acres proposed for salvage and along roadsides (about 173 acres). However, this alternative would not significantly reduce future fuel loads or reduce the intensity of future fires that may occur in the same place (Barker 1989; Kline 1996, SAF 1996, USDA 1994). Additionally, a direct effect of retaining high levels of snags across the landscape would be a potential rapid buildup of insect pest populations (Amman and Ryan 1991; Simon et al. 1994), which could spread to green trees, potentially creating an additional fuels hazard if those trees were to die.

Indirect Effects

Over time, the indirect effects of implementing Alternative 5 would be the creation of a landscape where fire suppression activities would be difficult and hazardous. Under Alternative 5, the likely scenario in the future would be to manage fires within the 2002 Apple Fire perimeter by retreating to ridge tops outside the fire perimeter and conducting suppression activities indirectly. The presence of numerous snags in the area would also contribute greatly to a decision to retreat and indirectly attack a fire to protect firefighters from falling snags. Alternative 5 would serve to compound fire suppression difficulties in the area as a whole.

Alternative 5 would complicate the reintroduction of fire as a tool to manage fuel loading and to meet ecological goals in the future because of the high density of snags and down wood that would remain. Prescribed fire in areas of high fuel loading and high levels of snag retention risks escape and killing growing trees and would require significant preparation and numerous entries to be successful, should it occur. Alternative 5 would not contribute to the effectiveness of future prescribed burning or other potential future projects to improve forest health, desired vegetation conditions, fire resilience or suppression effectiveness across the landscape.

In the majority of harvest units, the dead trees left after harvest would have a significant effect on fuels build up in the first 25 years. Table 23 displays the fuel accumulations in the future as a result of implementing Alternative 5.

Table 23. Alternative 5: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre (after 2 snags are felled for soil productivity).

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	3.98	4.13	24.12	77	5	5.32	6.77	40.02	39
10	5.22	6.02	39.14	49	10	7.94	9.46	51.39	22
15	7.14	9.66	55.63	38	15	9.66	11.29	69.23	18
25	9.00	11.21	74.02	29	25	11.55	14.82	90.14	12

Table 23 displays the accumulation of fuels likely to occur under Alternative 5. Retaining high densities of snags would result in heavy snag fall rates in the future as shown in units 45d and 73. This would result in fuel loadings that would be represented by a Fuel Model 11 within 5 years. Within 25 years, conditions would represent a Fuel Model 12, which would exhibit subsequently higher flame lengths, fireline intensities, and rates of spread. High flame lengths and fireline intensities may preclude direct attack by handcrews or dozers. The fire's rate of spread would exceed the sustained line production capability of a handcrew. Indirect attack, where fire lines are constructed away from the fire on ridges or along roads, would be required. Indirect attack results in larger fires, since the unburned area between the main fire and the fireline is intentionally burned in advance of the wildfire to eliminate fuel. The high density of snags present would most likely preclude the use of nighttime operations, normally the time when fire behavior is at its minimum and significant suppression activities may be conducted.

In response to comments received during the 45-day comment period, the Benchmark Fire, which occurred on the Tiller Ranger District in 1996 was examined. The area was salvaged utilizing a 50% retention prescription, similar to the Beschta prescription prescribed under Alternative 5. A fuels inventory was completed in 2003 for the Benchmark Salvage. The model used to predict the fuel loads for Baked Apple cannot account for fuels over 9" in diameter. The inventory completed for the Benchmark Salvage counted all fuels, including those over 9" in diameter. It is not possible to directly compare the two salvages, based on the limitations of the model. Therefore, only fuels under 9" in diameter are compared (Table 23A).

Table 23A. Comparison of 10-100 hour fuel accumulations (post salvage) between the Benchmark Salvage and the Baked Apple Fire Salvage.

Benchmark Salvage Fuels Accumulations between 1996 and 2003 (7 yr. time period)		Baked Apple Salvage Unit 73 (10 years post salvage)	
Size in Inches	Tons/Acre	Size in Inches	Tons/Acre
10 hr.	2.69	10 hr.	7.94
100 hr.	4.4	100 hr.	9.46
1000 hr.	10.9	1000 hr.	51.39

Table 23A demonstrates that higher fuels loads are predicted under Baked Apple, most likely because of differences in the stands (stand density, stem size, etc.). However,

overall, it can be concluded that fuel loads are likely to be higher in the long term under a Beschta-like prescription, due to the sheer amount of biomass that would be retained.

Shrub growth is likely to be extensive under the Alternative 5, as salvage and subsequent regeneration efforts would only occur on about 220 acres. The effects of shrub growth would be similar to those described under the No Action Alternative, except on the 220 acres that are reforested. These areas would respond in a manner similar to that described under the other action alternatives.

As depicted in Figure 33, a fire simulated after implementing Alternative 5 would burn about 923 acres during the first burning period. This is a 42% reduction in predicted acres burned than what occurs under the No Action Alternative; however, this alternative would likely burn 300 acres more than what burns under Alternative 2.

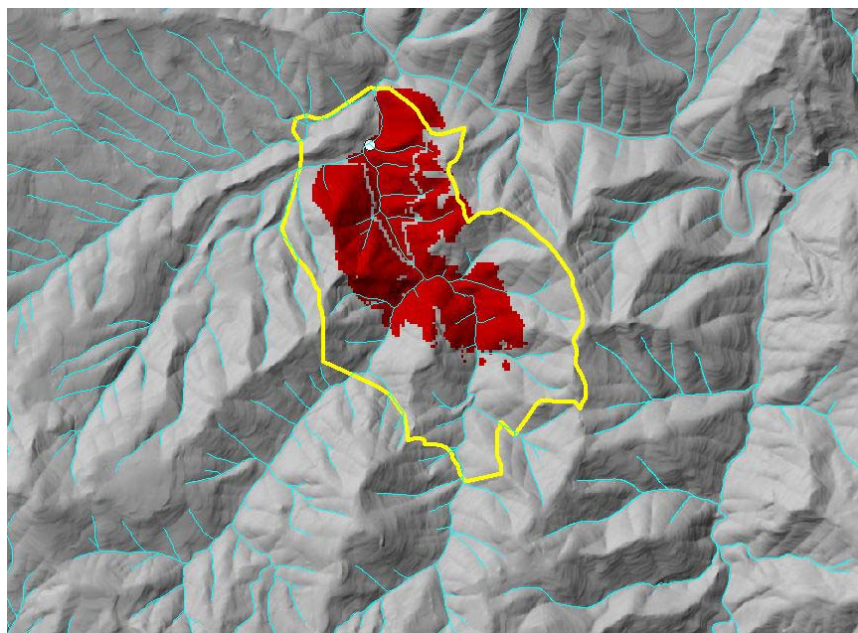


Figure 33. FARSITE Prediction for Alternative 5.

Alternative 6

Direct Effects

This alternative differs from the proposed action by focusing harvest in areas that historically experienced higher intensity fires. Strategic fuel breaks were identified along the perimeter of the Steep/Dry landscape area. After fuels treatment, harvest units would convert to a fuel model 11. The areas outside the proposed harvest units would be represented by the conditions representative of a fuel model 12 as stated in Alternative 1. The treatment of fuels within harvest units would breakup the continuity and arrangement of fuels upon the landscape giving fire managers options while attempting to suppress a future fire.

After completion of alternative 6 the surface fuels present would consist of the following approximate tonnage in each of the size classes, not including large material (downed

logs) left on site for wildlife or watershed purposes (Table 24). This would meet current Forest goals for hazardous fuels reduction.

Table 24. Average Residual Tonnage for Alternative 6.

10 hour fuels (1/4" to 1")	1.9 tons per acre
100 hour fuels (1" to 3")	2.4 tons per acre
1000 hour fuels (3" to 9")	15.8 tons per acre

After fuels treatment, a direct effect from this alternative would be a reduction in surface fuels, creating a condition in the harvest units that would resemble those found in a Fuel Model 11, as described under Alternative 2. The direct effects to fuel loads and fire behavior within the harvest units would also be similar to those described under Alternative 2; however, the harvest units that would retain high densities of snags would resemble the stands treated under Alternative 5. In these units, the short term direct effect of harvest and fuels treatment would create conditions like those found in a Fuel Model 11. The effect of retaining higher levels of snags would be the creation of conditions that resemble a Fuel Model 12 within 25 years. The short term reduction in fuel loads would lessen future fire behavior in these areas, resulting in greater flexibility in future fire suppression options and increased firefighter safety. However, the areas that would move rapidly into a Fuel Model 12 would cause concern for management of future fires, as described under Alternative 5.

Indirect Effects

Over time, the cumulative effects of implementing Alternative 6 would be the creation of a landscape with strategic fuel breaks where fire is most likely to occur and the maintenance of coarse wood across the landscape by retaining varying amounts of trees.

In the majority of harvest units, the dead trees left after harvest would have not have a significant indirect effect on fuels build up in the first 25 years. Areas that retained higher levels of down wood, however, would contribute to high fuel loads over time. Table 25 displays the fuel accumulations in the future as a result of implementing Alternative 6.

Table 25. Alternative 6: Potential Fuel Accumulations (tons/acre) and Remaining Snags/Acre (after 2 snags are felled for soil productivity).

Unit 45d					Unit 73				
Year	10 hr.	100 hr.	1000 hr.	Snags/ac	Year	10 hr.	100 hr.	1000 hr.	Snags/ac
5	2.08	2.77	18.26	4	5	1.04	1.51	38.79	74
10	1.20	1.60	10.54	4	10	1.62	2.38	66.59	56
15	.90	1.20	7.90	3	15	1.92	2.85	86.64	44
25	1.13	1.51	9.92	3	25	2.07	3.15	111.31	28

Table 25 demonstrates in this alternative, units that retained higher densities of snags are predicted to have a continuous and large build up of fuels over 25 years due to continuous snag fall. Fire behavior on the 195 acres that use the “Beschta” prescription would resemble conditions described under Alternative 5. The numerous snags would factor significantly into a fire manager’s decision to fight the fire by direct or indirect suppression methods. In contrast, in units that retained 4-15 trees per acre (722 acres), the resulting future fire behavior would be conducive to suppression actions and would have fewer snags that would put firefighters at risk.

Future reintroduction of fire as a tool to manage fuel loading within the 195 acres of high retention prescriptions would be difficult. Future prescribed fire in areas of high fuel loading risk escape and would require costly preparation and numerous entries to be successful. Within these areas, resistance to control in years 1 and 2 would be minimal, from years 3 to 5 it would range from medium to high, and after year 5 would range from medium to extreme.

In the 722 acres of salvage units where 4 and 15 trees per acre would be retained, the fuels accumulation decreases due to decay until the 25-year level where snag fall starts the accumulation again. The fire behavior associated with these conditions would be minimal during the first 25 years, in terms of fireline intensity, flame length, and rate of spread, and would be described by a “low” or “medium” FBPS fuel model 11. This type of fire behavior, in terms of flame length and fireline intensity, would enable initial action to be taken on a fire by hand crews. The numerous snags in the areas where 12-15 snags per acre were retained may, however, inhibit or preclude safe fireline operations, especially at night.

Under Alternative 6, shrub growth would be less than what is expected to occur under No Action, as reforestation would occur on about 864 acres, with an additional 600 acres planted along intensely burned riparian areas. The effects of shrub growth and reforestation would be similar to that described under Alternative 2.

Alternative 6 is predicted to burn about 599 acres during the first burning period (Figure 34); eliminating the unsuitable soils from salvage (a change between draft and final) would result in a negligible addition of fuels in the area (18 acres). This is approximately a 63% reduction in predicted acres burned than what occurs under the No Action Alternative. Additionally, this alternative burns 23 fewer acres than Alternative 2, 93 fewer acres than Alternative 3, 70 fewer acres than Alternative 4, and 324 fewer acres than Alternative 5 because of the placement of strategic fuel breaks across the landscape.

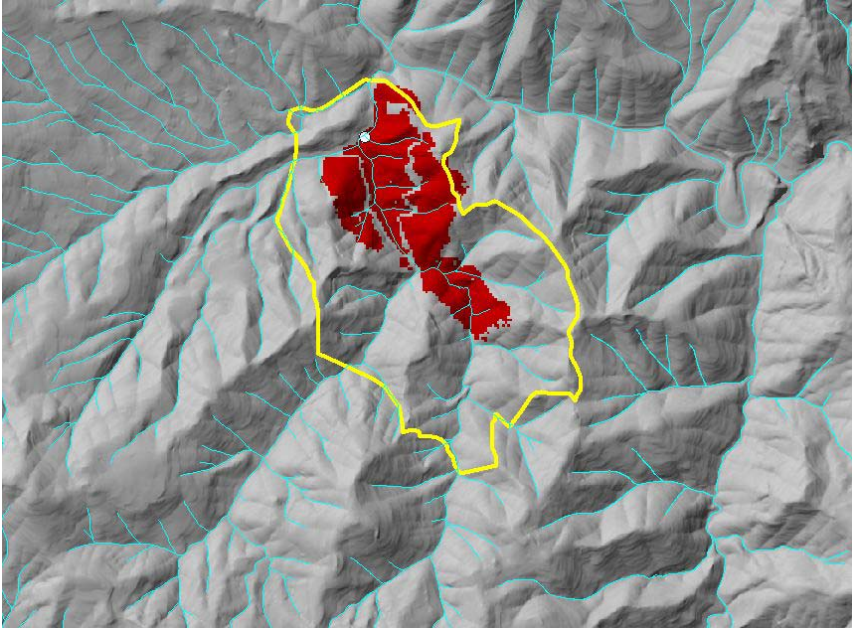


Figure 34. FARSITE Prediction for Alternative 6.

Cumulative Effects – All Alternatives

Fuels Structure/Condition

Historically, fuel models for the reference period consisted primarily of Fuel Models 8 and 10 in the mid and late seral stands. Fuel models 1 and 5, grass and brush respectively, totaled together 2% of the watershed. Fuel model 9 is comprised of a heavy leaf/needle layer often found in hardwoods and pure pine stands. Therefore, detecting fuel model 9 through use of aerial photos is difficult and it is entered as a fuel model 10 based on predicted fire behavior in this fuel model. The composition of fuel models within the watershed are displayed in Figure 35.

Fire suppression has been in effect through the Forest Service for approximately 80 years. Fire suppression using manpower was effective, but limited due to access. However, fire suppression through technology (road construction) began in the late 1940's. Since the 1940's forest fuels have been allowed to accumulate without mitigation measures to keep the levels in check.

Today, the condition and structure of fuels in the landscape surrounding the Baked Apple project can generally be described as a Fuel Model 10 (as described previously). Fire suppression has allowed heavy down and dead fuels to accumulate underneath a dense understory of trees and shrubs. As stated in the Middle North Umpqua Watershed Analysis, the current condition is a moderate severity fire regime with signs of transition to a high severity regime. Much of the landscape is in Condition Class 2 and 3. Some of the mid seral stands are supporting a Fuel Model 10 where historically these stands would typically support a Fuel Model 8 due to periodic low intensity ground fires. These fires would typically burn in areas where fuel concentrations exist and stand replace areas where drainage winds, weather and the steep dissected slopes occurred. This would include both sides of the North Umpqua River corridor. High severity fires can be expected particularly in areas where Fuel Model 10 from the reference condition has

maintained a Fuel Model 10 today. The Calf Creek Roadless Area and Late-successional Reserve (LSR) 222 lies to the east of the planning area; over 9,000 acres of this area burned during the 2002 fires. This area would also function as a Fuel Model 12, but future fires would be expected to be severe, as no fuel removal activities are planned. The 68,000+ acres that burned during the 2002 Tiller Fires both consumed and created fuels. Salvage activities are proposed on approximately 450 acres (Ash Creek and Acker salvages). The salvage areas would alter fuel conditions, similar to those altered by this project. The areas not salvaged would likely accumulate wood similar to that which is projected to occur for the unsalvaged portions of the Apple Fire.

Figure 35 shows a comparison on a thousand acre basis of reference fuel models and current fuel models within the watershed; Fuel Model 12, which is not displayed in the graph, was not present at a detectable level in the watershed prior to the 2002 fires.

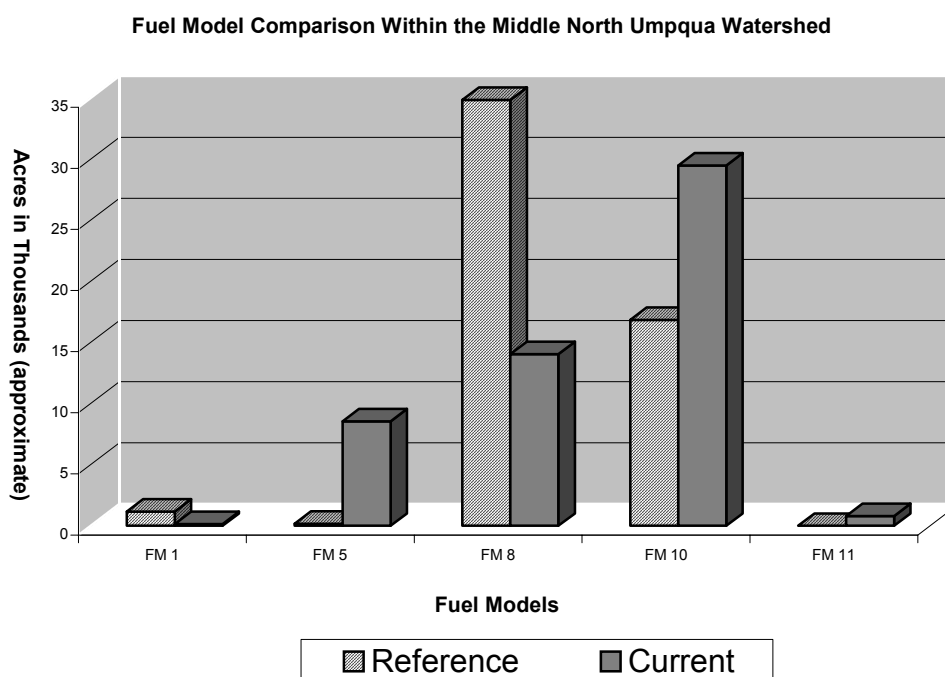


Figure 35. Fuel Models in the Middle North Umpqua Watershed.

The cumulative effects of Alternatives 2, 3, 4, and 6 in the Baked Apple Fire Salvage Project would be to move areas that would be salvaged into a Fuel Model 11 in the long-term. Alternatives 1 and 5 would have short-term changes to a Fuel Model 11, but in the long-term, Fuel Model 12 conditions would occur. Across the landscape, Fuel Models 10 and 8 would dominate. Alternatives 2, 3, 4, and 6 would create areas of fuel breaks and would alter future fire behavior. Alternatives 1 and 5 would continue to contribute high fuel loads across the landscape, contributing to cumulative fire effects in the future.

FIRE EFFECTS/FIRE BEHAVIOR

A moderate severity fire regime generally describes the landscape surrounding the Baked Apple planning area. Moderate severity fire regimes can be described as infrequent fires (35-100 years) that are often partial stand replacement fires and include areas of high and low intensity. Analysis of historic fire patterns and the topographic character of the planning area indicate that it normally experiences high intensity fires. Fire suppression, timber harvest, and road building as described in Table 8 have contributed to cumulative effects to fire behavior across the planning area and the landscape. Fire suppression has limited the acres that burn within the watershed, has converted some stands from fire tolerant species to fire intolerant species, and has allowed for an increase in fuels within old growth stands. Timber harvest has broken up stand continuity throughout the landscape, changed stand structure and plant association, and has caused microclimate changes, particularly in temperature and humidity. Finally, road construction has provided natural barriers for fire spread and has aided in fire suppression by allowing direct access to fire starts. Cumulative, these activities have moved today's Condition Class away from what previously occurred.

These influences have affected the range of variability. Fire is less prevalent on today's landscape than in prehistoric times, due to effective fire control policies. Ironically, success in fire suppression has allowed more uniform and increasing fuel loads across the landscape, shifting forest fire effects that were typically of low and moderate severity in historic fires to more severe fire effects today. The lack of fires interaction and increase in management interaction with the environment directly affects landscape burn patterns today.

In late seral stands fire suppression has allowed forest fuels to increase altering the fuels condition. Today's fuel model 10 contains a higher quantity of all size classes where reference fuel model 10 periodically burned and maintained lower levels of 0-3" material. Tolerance or resiliency to fire has decreased. This trend is expected to continue, as this project would not affect the surrounding landscape.

Burn patterns would likely be contiguous and moderate to high intensity where topography is steep, dissected and south to southwest aspects. This would hold true particularly in the roadless areas where access is limited. The harvest activities associated with Alternatives 2, 3, 4, and 6 in the Baked Apple Fire Salvage would break up the continuity of fuels and would create a patchy burn with a greater amount of low to moderate severity fire effects. The burn patterns for the majority of the watershed can be expected to be a combination of low, moderate, and high intensity creating a patchwork across the landscape.

Comparison of Alternatives

Table 26 displays the fuel models, fuel loadings, future fire behavior, future fire size, and residual tons per acre of activity-generated fuels that would occur as a result of implementing or not implementing the project.

Table 26. Comparison of Alternatives using fire and fuels parameters.

FUEL MODELS						
Unit 45d						
Year	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
0 (immediately after the fire)	8	8	8	8	8	8
5	11	11	11	11	11	11
10	12	11	11	11	12	11
15	12	11	11	11	12	11
25	12	11	11	11	12	11
Unit 73						
Year	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
0 (immediately after the fire)	8	8	8	8	8	8
5	11	11	11	11	11	11
10	12	11	11	11	12	11
15	12	11	11	11	12	11
25	12	11	11	11	12	11
FUEL LOADINGS - SALVAGE UNITS (range of tons per acre)						
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Tons/ac	57-70	13-26	19-28	16-52	47-66	20-68
FUTURE FIRE BEHAVIOR - PLANNING AREA						
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Intensity of fire	High Intensity	Low-Moderate Intensity	Low-Moderate Intensity	Low-Moderate Intensity	High Intensity	Low-Moderate Intensity
APPROXIMATE FUTURE WILDFIRE SIZE PREDICTED BY FARSITE						
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Acres	1579	622	692	669	923	559
AVERAGE RESIDUAL TONS PER ACRE OF ACTIVITY GENERATED FUELS						
Fuels	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
10 hour	NA	1.6	1.8	1.1	1.3	1.9
100 hour	NA	2.6	2.1	1.3	2.2	2.4
1000 hour	NA	16.6	16.1	14.1	7.7	15.8

Alternatives 1 and 5

Fuels would continuously build up over the project area and outside the project area, at the rates described previously. Alternative 5 harvests less than 50% of the dead trees in the stands; although this would reduce fuels, the reduction is minimal and would not remove enough fuel to change the resulting fuel model. However, Alternative 5 generates the least amount of activity fuels, as less logging would occur. Alternatives 1 and 5 would create future fire behavior that would cause difficulty suppressing fires and would impede the ability of managers to use prescribed fire in the future. Total fuel loadings would remain high. Fire regimes would be low in the initial stages and transition to a moderate to high fire regime in the future as fuels accumulate and vegetation grows. Fuel models would be represented with a fuel model 11 in the short term and transition to

a fuel model 12 after about 5 years. Fire intensities associated with fuel model 12 would likely cause excessive soil heating, high mortality to vegetation and considerable amounts of emissions from smoke. Future fire growth would be large; Alternative 1 results in the largest wildfire in the future, followed by Alternative 5. Alternative 5 burns 656 acres less than Alternative 1 under a future fire scenario; this demonstrates that breaking up the arrangement and continuity of fuels through salvage would have an impact on future fire growth.

Action Alternatives 2, 3, 4, and 6

Fuels would build up at slower rate due to removal of fuels through harvest. Fuels would be represented by a fuel model 11 within harvest units, due to the breaking up of the continuity and arrangement of fuels within the project area. Future fire behavior associated with the action alternatives after harvest and fuels treatment would be reduced, allowing for safer and more effective suppression operations within the project area. Implementation of future prescribed fire projects would be safer, easier and have greater benefits. Conditions outside the project area would exhibit fire behavior and fuels conditions described under the no action alternative. When a fire occurs outside the project area and advances toward the treated areas within the project area, effective suppression operations could be implemented utilizing the treated areas as control points or fire breaks due to diminished fire behavior caused by the removal and treatment of fuels. Fire regimes would be low in the initial stages and transition to moderate in the future, as fuels accumulate and vegetation continues to grow. Future fire growth is limited as more fuels are removed. Alternative 6 is most effective at limiting future fire growth, followed by Alternative 2, 4, and 3 (in terms of greatest to least effective).

Effects of Fire Suppression Activities

During the Apple Fire, suppression activities included construction of firelines. Fireline construction removes fuels to mineral soil in order to slow or stop fire spread. In addition fuels are cut to widen the area where fireline would be located. Methods for construction of fireline include use of mechanized equipment (dozers) and hand construction. Where fireline was constructed, extensive rehabilitation took place before the fall rains of 2002. Rehabilitation included placing woody material that was not consumed by the fire back into the fireline, which immediately increased effective ground cover. On steeper slopes, waterbars were constructed in firelines to divert water runoff away from burned areas. Firefighter safety zones that were constructed with mechanized equipment were rehabilitated by spreading native grass seed, which helped reduced erosion potential and noxious weed encroachment.

Hazard tree falling also occurred as part of fire suppression activities. In most cases, these trees were left on site, adding to existing fuel loadings. In a small area of the fire, mostly along Road 4714, a feller-buncher was used to fell and stack the logs along the roadside. A self-loading log truck and a forwarder were the used to remove the hazard trees. This helped reduce the fuels along this road. Roadside brushing occurred along most of the roads in the planning area, increasing safety during travel and reducing fuels in preparation for burnout operations. The fuels created by this activity were piled and burned; this also helped reduce fuels along these roadsides. Finally, burnout operations were conducted on about 1,200 acres during the suppression of the Apple Fire. Most

burnout operations resulted in mosaic burns or underburns. This had a beneficial effect of reducing fuels throughout the burnout area.

TERRESTRIAL WILDLIFE HABITATS

Scoping identified a number of concerns related to the impacts of the proposed salvage activities on terrestrial wildlife and/or components of their habitat. There is a concern that salvage logging would decrease the structural diversity of early-successional habitat by harvesting more than 50% of the trees within the salvage units. This issue is tracked under the title of early-successional habitat with snags. Scoping identified a concern that the proposed salvage harvest may impact some stands that are still functioning as late-successional habitat. This issue is tracked under the title of late-successional habitat. Scoping identified a concern that salvage logging would decrease the current and future availability of down, dead wood. This issue is tracked under the title of coarse woody debris and continues under the discussion of distribution of dead wood. Scoping also identified a concern that spring burning of slash may impact birds passing through the area. This issue is tracked under the title of landbirds.

Background: Natural Range of Variability, Pre and Post Fire

The Middle North Umpqua Watershed Analysis (USDA 2001) defines terrestrial habitats in terms of three successional stages and five habitat types. Before the Apple Fire, these habitats were near or within their estimated natural range based on acreage, but more fragmented than they historically were. Within the planning area, there is a large area of gentle/moist terrain located on the eastern slopes of Panther Ridge and around the tributaries and headwaters of Panther and Fairy Creeks. This landscape feature usually “dampens” the effects of wildfire (depending on weather) within the planning area. Because of this, the “natural range” of successional conditions is slightly different in the planning area from that of the larger Middle North Umpqua River watershed. The natural range for early-successional habitat within the planning area is lower than in the larger watershed and the range for late-successional habitat is slightly higher, as displayed in Figure 36.

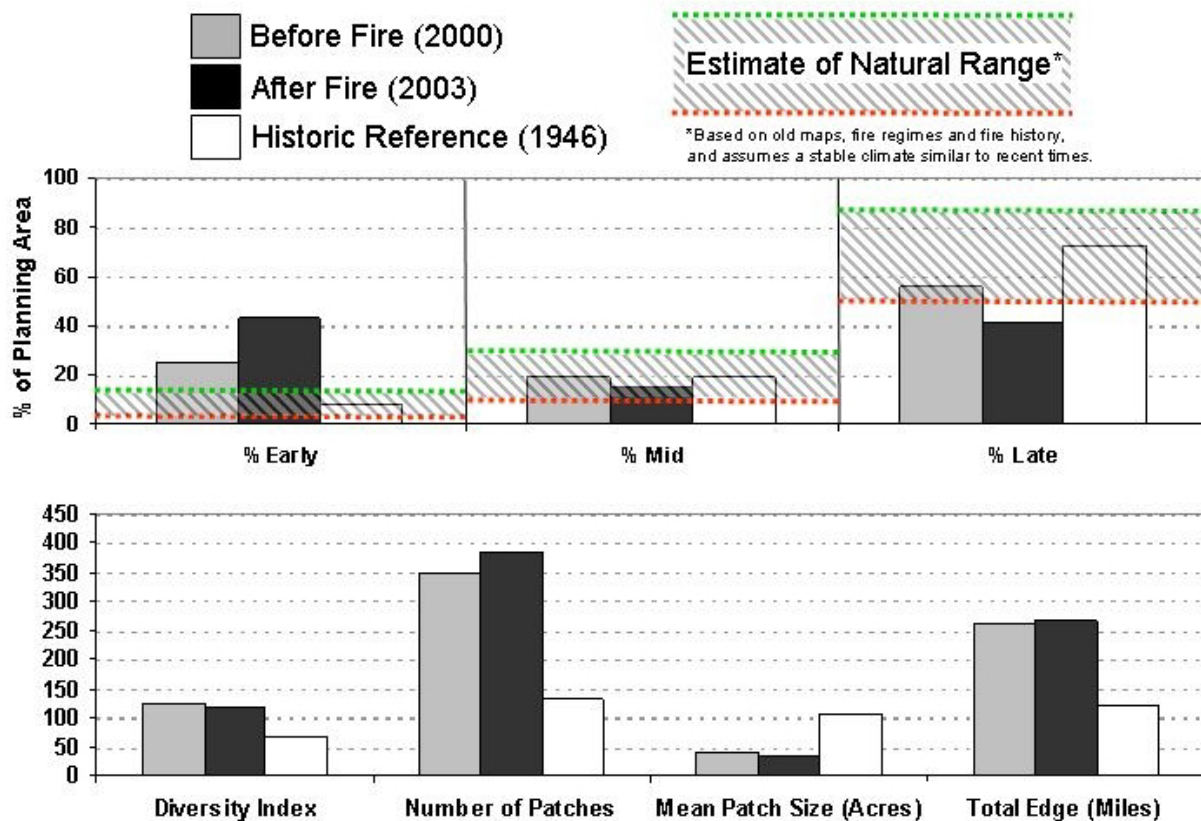


Figure 36. The Apple Fire increased early and decreased late-successional habitat (both estimated to currently be outside of the natural range) within the planning area. Mid-successional habitat decreased slightly but is still within its natural range (acreage-wise). The landscape is now slightly less fragmented due to a large patch of early-successional habitat in Limpy Creek. However, it is still more diverse and fragmented than the historic landscape was.

AQUATIC CONSERVATION STRATEGY - TERRESTRIAL COMPONENTS

Affected Environment

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the long-term ecological health of watersheds and aquatic ecosystem. This strategy is applied over broad landscapes as opposed to individual projects or small watersheds. The ACS seeks to accomplish this goal by maintaining the natural disturbance regime which operates over long time scales on the order of decades or longer (Northwest Forest Plan ROD B-9). To help attain the goal of the ACS, a landscape plan was developed in the Middle North Umpqua watershed analysis that would re-establish landscape patterns associated with the local natural disturbance regime (USDA, 2001).

Changes in landscape patterns were analyzed in the watershed analysis by comparing the current patterns with historic patterns. The historic vegetation patterns were developed from historical vegetation mapping from 1914 and 1932. The 1946 aerial photos were also used to help establish the historic range of vegetation patterns.

Figure 36 shows how fire changed the landscape-scale features of the watershed in relation to the estimated natural range. In some cases, fire caused certain features to fall outside of the natural range (e.g., late-successional forest habitat). In other cases, it moved the watershed to a more natural condition (e.g., less landscape diversity and fragmentation because many small patches were replaced with the larger fire area).

Environmental Effects

Direct, Indirect and Cumulative Effects

The 2002 Apple Fire caused greater impact to terrestrial habitats and their related objectives, when compared to the proposed salvage activities. The Baked Apple project affects two of three terrestrial habitat components: early and late-successional habitat. It does not impact mid-successional habitat.

All action alternatives are designed to maintain the distribution, diversity, and complexity of the watershed's landscape-scale features (ACS objective 1) by not moving early and late-successional habitat outside of or further away from their natural range by increasing or decreasing their landscape pattern acreages. By doing this, the action alternatives also maintain the spatial connectivity of these features within and between watersheds (ACS objective 2). Landscape connectivity is aided by riparian and unsuitable soil buffers. A direct effect of Alternative 4 is the removal of a portion of the 12 to 18 inch d.b.h. dead trees in the outer 180 feet of the Riparian Reserves that are adjacent to harvest units. This limited amount of removal (32 acres scattered across the Limpy Creek drainage) would not adversely affect connectivity for riparian dependent species (e.g., Pacific shrew).

By following the landscape plan and timber harvesting recommendations in the watershed analysis (USDA 2001), the action alternatives would allow the forest within the planning area to move towards a desired range of landscape patterns and stand structures, which approximate the natural disturbance regime. Once attained, the planning area would provide the appropriate amounts of habitats to support well-distributed populations of native wildlife species (ACS objective 9). Of the action alternatives, Alternative 6 most closely follows the landscape plan by focusing the timber harvesting within the "steep and dry landscape area" as identified in the watershed analysis. Alternative 1 would result in no change to landscape patterns, and therefore no impacts. Cumulatively, past management actions (mainly clearcut harvesting) have caused the landscape-scale features (Figure 36) to move outside of their natural ranges. Proposed and foreseeable future actions are not anticipated to degrade these conditions further, but would maintain or restore these conditions in the future.

EARLY-SUCCESSIONAL HABITAT WITH SNAGS - TRACKED AS A SIGNIFICANT ISSUE

Affected Environment

It was determined during scoping that the salvage of dead trees would decrease the structural diversity of the early-successional habitat that was created by the fire. The

measure selected to assess the impacts of the alternatives is the percentage of this type of habitat that would be salvaged to less than 50% of its current tree density. This measure was selected because it directly responds to the concern raised by the public, as cited in Beschta et. al. (1995).

Early-successional habitat can have two different types of structure. It can have high densities of dead trees, such as after a stand-replacing fire as described by the “stand initiation structure stage” discussion in the Middle North Umpqua Watershed Analysis (USDA 2001). It can also be devoid of dead tree structure, such as in a clearcut unit or meadow. As shown in Figure 36, early-successional habitat was above its estimated natural range before the fire. This deviation from the natural range was mainly caused by clearcut harvesting (including post-fire salvaging from the 1987 Apple Fire), creating many acres of early-successional habitat almost devoid of large dead trees, as shown by a large snag inventory conducted in 2002 (Davis 2003).

The Apple Fire increased the amount of early-successional habitat and pushed the acreage further away from its estimated natural range. However, about 2,066 acres of the early-successional habitat the fire created has high densities of large dead trees (snags). This type of early-successional habitat (with high densities of dead trees) was “highly deficit” within the Middle North Umpqua watershed (USDA 2001) prior to the fire. About 165 acres of this habitat occurred within the Wild and Scenic River Corridor, as a result of the 1987 Apple Fire. The amount of early-successional habitat with high densities of dead trees is now within its estimated natural range, even though total acreage of early-successional habitat is higher than it is estimated to naturally occur. The median density of standing dead trees (≥ 16 inch d.b.h.) within the proposed salvage units is around 51 trees per acre (USDA 2003). This tree density is similar to that found in unmanaged stands for the plant series found within the planning area and would be the normal expected density of large dead trees after a stand-replacing wildfire (USDA et. al. 1998).

Environmental Effects

Direct Effects

Salvage operations associated with the action alternatives would not change the acreage of early-successional habitat within the planning area. The total amount would remain higher than the estimated natural range. However, removal of standing dead trees alters the amount and structure (e.g., tree density) of the fire-created early-successional habitat with high densities of dead trees. Reducing the density of dead trees may have direct impacts to wildlife that depend on this type of post-fire habitat (e.g., woodpeckers, various landbirds).

The issues raised during scoping that salvaging would decrease the structural diversity of early-successional habitat by harvesting more than 50% of the trees within the salvage units originates in the salvage recommendations of Beschta et al. (1995). The authors recommend “leaving at least 50% of the standing dead trees in each diameter class”; however, no scientific basis is given for this percentage. In order to respond to the issue, the direct impacts of the proposed activities are compared using the percentage of the total early-successional habitat (with high tree densities) within the planning area that would be salvaged to less than 50% of its current dead tree density (Figure 37).

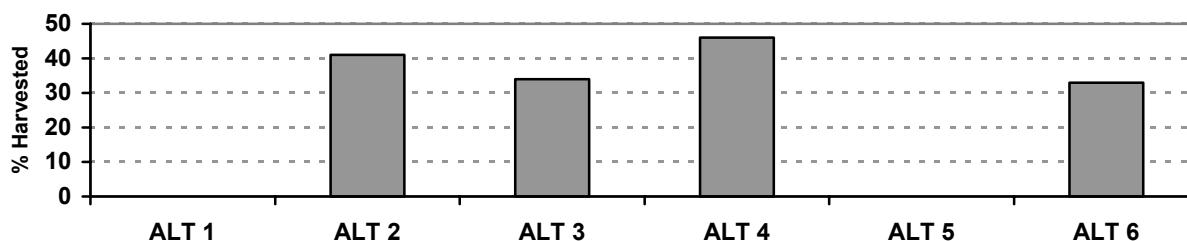


Figure 37. Comparison of alternatives, direct impacts to early-successional habitat based on percentage of the total post-fire habitat within the planning area that would have >50% of the standing dead trees harvested.

Alternative 1 has no direct effect on the structural diversity of early-successional habitat. Alternative 5 maintains relatively high densities of dead trees ($\geq 50\%$) and therefore is considered to have an insignificant impact. Alternative 4 reduces dead tree densities to below 50% over the highest amount of that habitat type (45% of the existing 2,066 acres, or 1,138 acres), followed by Alternatives 2, 3, and 6 (in order of most to least impact).

Under all alternatives, over 50% of the existing fire-created habitat within the planning area would not be harvested; these are the areas not proposed for salvage. This habitat type remains well distributed across the planning area with the Riparian Reserve network and as scattered patches. In addition, the retention of various amounts of dead trees within harvest units in all proposed action alternatives helps to maintain structure for wildlife within the harvest units (retention levels are based on the best available scientific data). For these reasons, the direct effect from these proposed management activities is not expected to have a significant impact on early-successional habitat and related wildlife (USDA 2001).

Indirect Effects

Reforestation can speed up the rate of vegetative succession and shorten the length of time that early-successional habitat is available to associated wildlife (e.g., grass/forb and shrub/forb species). The indirect impacts of the proposed alternatives are compared using the acreage of early-successional habitat being proposed for planting with conifer (Figure 38).

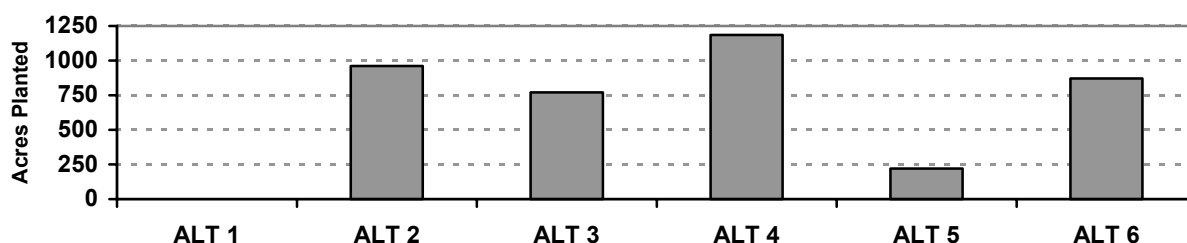


Figure 38. Comparison of alternative impacts to early-successional habitat based on acres being planted with conifer.

Alternative 1 has no indirect effect on early-successional habitat. Alternative 5 has the least impact because it replants the lowest amount of acreage to conifer. Alternative 4 plants the most acreage, followed by Alternatives 2, 6 and 3 (in order of most to least

acres planted). Overall, by speeding up the successional timeframe, early-successional dependent species, such as the western bluebird, would potentially decrease quicker in populations and migrate to other areas where early-successional habitat is available. This cycle is a natural ecological process that would be affected by reforestation. However, this effect is insignificant as long as early-successional habitats are available on the landscape within the planning area over time and space within their natural range.

Cumulative Effects

Prior to the fire, slightly over 2,000 acres of early-successional habitat existed within the planning area; this habitat was “set back” by the fire. These areas did not contain salvageable trees and are not part of this proposed project, but they are planned for future reforestation. Recent actions include approximately 55 acres planted along the lower 3 miles of Limpy Creek and 287 acres of conifer planting on burned plantations. Proposed activities associated with this project include salvage logging, underburning, and planting of salvage units. Foreseeable future actions include 112 acres of planting from the Apple Seed project and reforestation of the approximate 1,600 acres of burned over plantations.

Cumulative impacts are compared by showing how many acres of early-successional habitat would be impacted through the various types of past, present and foreseeable future management activities under each alternative. In addition, in some areas the same piece of ground (and habitat) would be impacted more than one time as different activities occur at different times (e.g., salvaging, burning and then planting). Therefore, levels of management intensity are also compared using the number of activities occurring on the same piece of ground (Figure 39). It is assumed that the amount and intensity of management activities is proportional to the impact on species that occur and/or depend on early-successional habitat (i.e. the more management, the higher the impact).

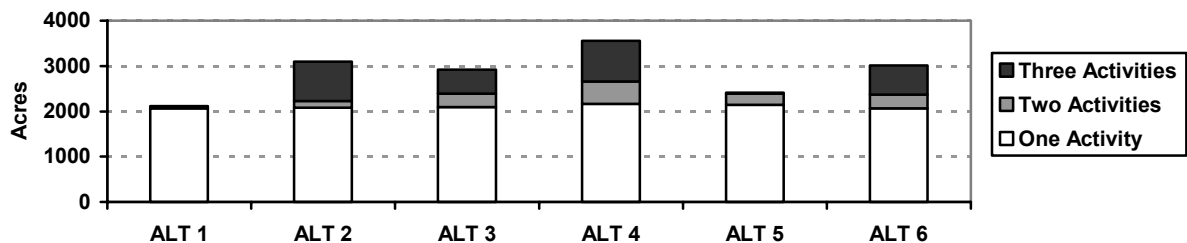


Figure 39. Comparison of cumulative impacts to early-successional habitat, and related wildlife species, based on total acres of past, proposed and foreseeable actions including salvage, prescribed burning and planting of conifer (level of management intensity is indicated by the number of activities that would occur on the same piece of ground).

Alternative 1 has the least amount of cumulative impacts and includes only the activities associated with the Apple Seed project and foreseeable tree planting. Alternative 5 has the second least amount of cumulative impact and does not propose any underburning, but only pile burning in the fall season. Following, in order of least to most cumulative impacts, are Alternatives 3, 6, 2 and 4.

Due to the excessive quantity of early-successional habitat currently within the planning area (about 2.7 times higher than the upper estimate of the natural range), the cumulative impacts associated with the alternatives are expected to have negligible

affects on early-successional wildlife. The acreage of early-successional habitat that is **not** being impacted (salvaged or planted), covers about 17-28% of the planning area (depending on the alternative). This is still higher than the estimated natural range of variability for this type of habitat.

LATE-SUCCESSIONAL HABITAT - TRACKED AS A SIGNIFICANT ISSUE

It was determined during scoping that the salvage of dead trees would potentially impact late-successional/old growth stands that burned with less intensity (underburned or mosaic burned). In particular, some of the stands proposed for salvage contain large, old, live, green trees. Salvage may damage these trees and/or impact the “functionality” of the late-successional stands. The measure selected to assess the impacts of the alternatives is the acreage of late-successional habitat being salvaged by each alternative. This includes acres being treated for partial removal and hazard tree reduction. This indicator was selected because it quantitatively defines the potential for the proposed activities to impact this habitat type.

Affected Environment

The 2002 Apple Fire had a large impact on late-successional habitat. Within the planning area, the fire stand-replaced about 2,028 acres (27%) of the existing late-successional forest habitat. Approximately 5,471 acres of late-successional forest habitat currently exists within the planning area, sixty-one percent of which was underburned by the fire.

However, portions of a few proposed units in some of the alternatives have enough green trees left that survived the fire, that they are still considered late-successional habitat. These units are designated for “partial removal” or harvesting of dead trees that are intermixed with the green trees. They occur mainly within the Panther, Fairy and Bachelor Creek drainages, where the fire burned more of a mosaic pattern, creating smaller patches of dead trees, as opposed to the large patch of dead trees created in the Limpy drainage.

Ecological processes such as low-to-moderate intensity wildfire are essential for the development or maintenance of late-successional forest habitat into old growth. Disturbance creates the structure and diversity associated with late-successional/old growth forests by killing individual or small patches of trees, creating canopy openings (or gaps) which allow the establishment of trees beneath the overstory. Fire also creates standing dead trees (snags) and down logs on the forest floor, providing some of the overall habitat diversity in the area.

The portions of the surviving late-successional habitat that may be impacted by this project occur along the edges of stand replacement patches or along road corridors. The potentially impacted areas range from 0.1 to 8 acres in size, with an average size of about 2 acres. Their spacing averages about 0.5 miles between each other. The amount of forest openings (edges) surrounding these stands reduces their suitability for several late-successional species that prefer “interior” late-successional habitat.

Environmental Effects

Direct Effects

Salvage logging operations would simplify stand structure within the surviving late-successional stands by removing small patches and/or individual dead trees. Timber

harvesting also has the potential to damage remaining green trees. These impacts would degrade the quality of habitat for wildlife that depend on the dead wood component within these stands, such as the Vaux's swift, which commonly nests in large hollow snags and trees. The direct impacts (habitat degradation) of the proposed alternatives on late-successional habitat are compared using the acreage of late-successional habitat being salvaged by each alternative. This includes acres being treated for partial removal and hazard tree reductions (Figure 40).

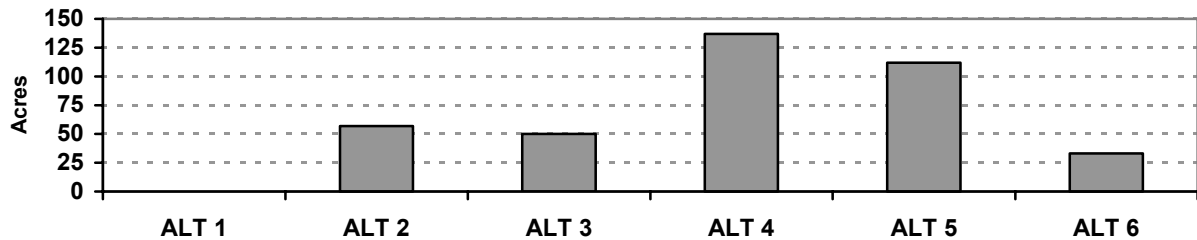


Figure 40. Comparison of alternative impacts to late-successional habitat based on acreage of late-successional habitat being salvaged within units and roadside hazard tree reduction areas.

Alternative 1 has no direct impact on late-successional habitat and wildlife that depend on it (e.g., pileated woodpecker, clouded salamander, etc.). Of the action alternatives, Alternative 6 has the least amount of impact on this habitat because salvage units were designed to avoid the surviving late-successional habitat and focus on the large stand-replaced patch in Limpy Creek drainage. Exceptions occur for ridge-top fuel break construction and roadside hazard tree reduction (this impact is reduced because the 4714 road is not needed for harvesting/hauling activities in Alternative 6). Alternative 4 has the largest impact to late-successional habitat mainly because of the increased number of roadside hazard tree reduction areas. This alternative is followed (in terms of most to least impact) by Alternatives 5, 2, 3 and 6.

Overall, the action alternatives impact a very small proportion (0.6% to 2.5%) of the remaining late-successional forest habitat within the planning area. They do not impact important corridors of habitat between large patches of late-successional forests within and adjacent to the planning area. Because of this and the small size and dispersed nature of the partial removal and hazard tree units and their adjacency to forest openings (edges), the direct impacts on the character of the late-successional stands from Alternatives 2-6 are considered to be insignificant to late-successional habitat and related wildlife.

Indirect Effects

Reforestation can speed up the rate of vegetative succession and achieve late-successional habitat quicker. This activity has an indirect beneficial impact on late-successional wildlife (e.g., northern spotted owl). A graphical comparison of indirect impacts by alternatives is shown in Figure 38, which displays the amount of reforestation proposed by alternative. Alternative 1 has the least indirect beneficial effect on late-successional habitat because it does not plant conifer. Alternative 4 has the greatest beneficial indirect effect because it replants the highest amount of acreage to conifer. This is followed by Alternatives 2, 6, 3 and 5 (in order of most to least beneficial impact).

Cumulative Effects

Cumulative effects on late-successional habitat are analyzed at two scales; (1) the Middle North Umpqua watershed-scale, which is a 52,973 acre watershed analysis area and (2) the 5th-field watershed scale (123,914 acres). The analysis considers past, present and foreseeable future impacts including fire-effects, reforestation and forest succession. The estimated natural range for late-successional forest habitat within the Middle North Umpqua River watershed is “wider” than adjacent watersheds due to the fire regime associated with it (USDA 2001), but slightly “narrower” than the planning area (as previously discussed). Large stand-replacing fires are not uncommon in this watershed, and wildfires have caused the amount of late-successional forest to drop by over 20%, as seen in the early 1900s. Clearcut timber harvesting further reduced late-successional habitat by 20% from the 1940s to the 1990s, taking it below its natural range. The listing of the northern spotted owl and the resulting Northwest Forest Plan curtailed this trend by the mid-1990s.

Stands that were burned over in the early 1900s are beginning to transition back into late-successional forests, reversing the trend caused by logging. The Apple Fire caused a slight “dip” in this trend, slowing the watershed’s recovery by about a decade. The current amount of late-successional forest is now about 7% below the lower end of the estimated natural range for the watershed analysis area. Currently planned timber sales, including the proposed project, do not cause a negative trend for late-successional forest within the Middle North Umpqua watershed analysis area.

At the 5th-field scale, the Northwest Forest Plan requires retention of late-successional forest patches in watersheds where little remains. This standard and guideline applies in 5th-field watersheds, “...in which federal forest lands are currently comprised of 15% or less late-successional forest” (ROD C-44). The planning area occurs within the Middle North Umpqua River 5th-field watershed. Current levels of late-successional forest on federal forest lands within this watershed are at about 51% (Figure 41). The cumulative impact from proposed or foreseeable future actions (e.g., Felix and Meow Timber Sales and the Dry Creek hazardous fuels project) on late-successional forest within this watershed would potentially lower the current level by less than 1%; this is considered an insignificant cumulative impact to late-successional habitat.

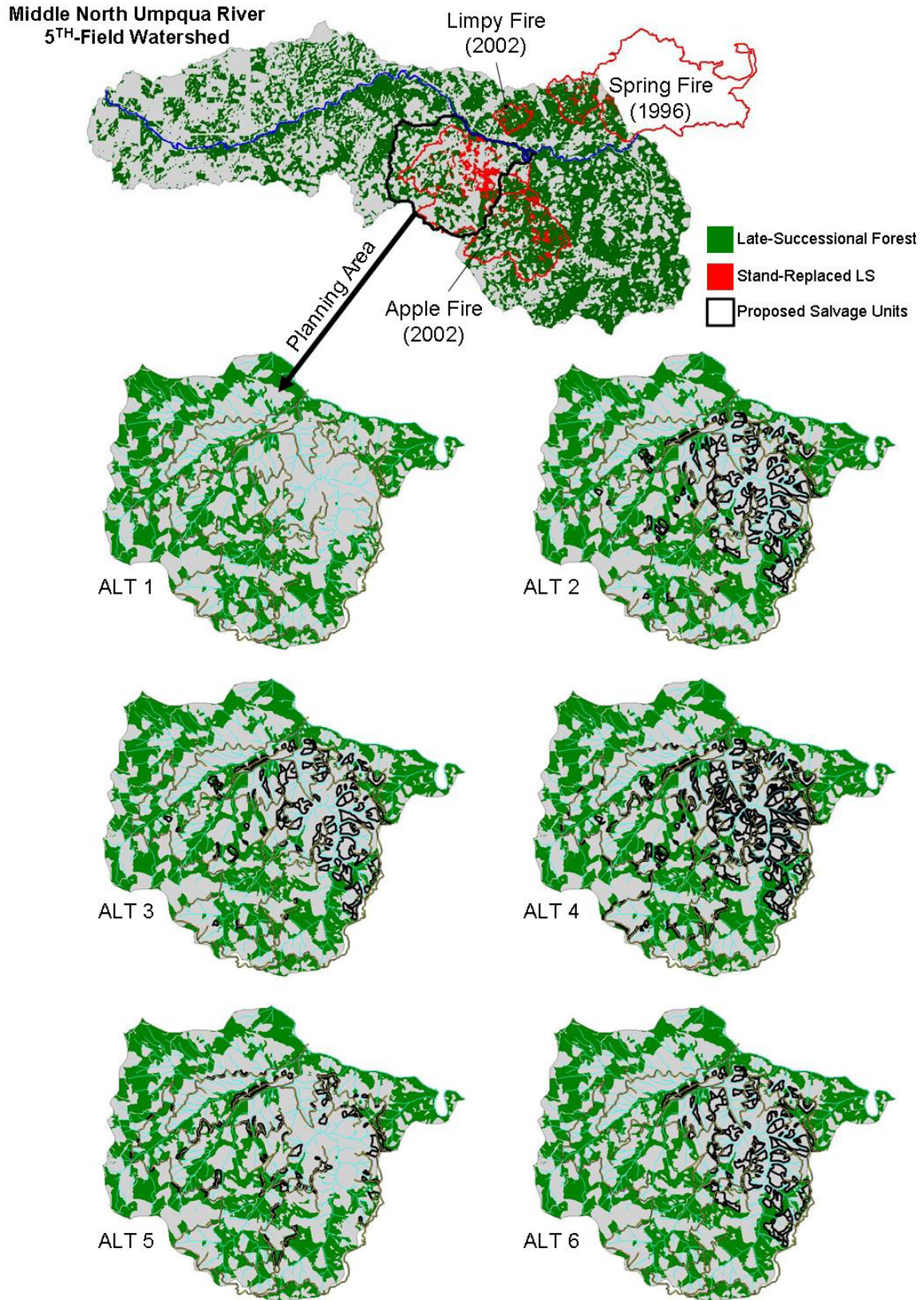


Figure 41. Late-successional forests (shown in green) and those stand-replaced by wildfires since 1996 (shown in red) within the 5th-field watershed are shown at the top of the figure. Proposed salvage units are shown in relationship to late-successional forests by alternative within the planning area.

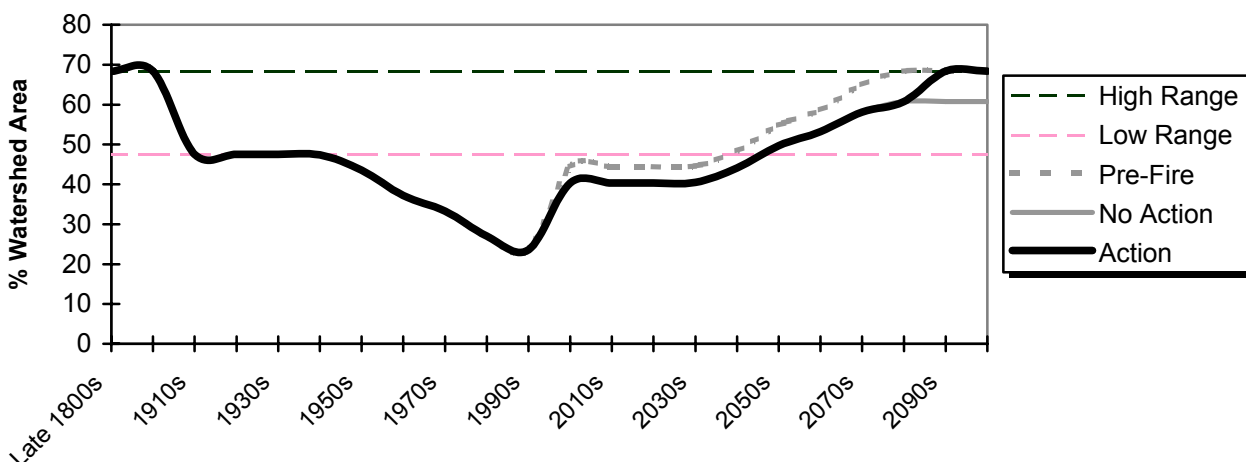


Figure 42. Cumulative effects trend line showing the past changes and projected increases in the amount of late-successional habitat within the larger Middle North Umpqua River watershed.

Under current management direction, and as a result of natural and managed forest-succession, late-successional forests are expected to reach their reference levels by about mid-2050 (Figure 42). The no action alternative would not slow down this event, but would lengthen the time it takes to reach the high range by a couple of decades, due to no reforestation of harvest units and slower forest succession. No other cumulative effects are anticipated.

COARSE WOODY DEBRIS - TRACKED AS A SIGNIFICANT ISSUE

It was determined during scoping that the salvage of dead trees would potentially impact the current and future availability of down, dead woody material. Salvage would remove dead trees that are important for biological and physical processes, and as a source of future soil and site productivity. The measure selected to assess the impacts of the alternatives is the number of trees or snags retained per acre within the salvage units. This indicator was selected because it quantitatively defines the amount (snags per acre) of this habitat component that would be left following salvage, thus providing for current and future needs.

Affected Environment

The importance of dead trees (standing and on the forest floor) as wildlife habitat has been recognized for many decades (Grinnell and Storer 1924, Graham 1925). Snags and down wood are important in terms of both biological and physical processes, and as a source of future soil and site productivity. Snags (dead standing trees) also pose a human-safety hazard and dead wood in general serves as an ignition source and fuel for wildfires. Management of this natural resource for healthy forests and wildlife presents challenges, tradeoffs, and risks to other resources (Thomas 2002).

Snag abundance on private forestlands is currently (and into the foreseeable future) inadequate to support viable populations of indigenous wildlife species that require this

habitat (Ohmann et al. 1994). At a landscape scale, dead tree patches have largely been missing from western Oregon forests because of fire suppression and post-fire timber salvaging; a noticeable change occurred with the 1991 Warner Creek Fire on the Willamette National Forest which was not salvaged.

As a response to extensive areas of forested lands becoming devoid of large snags, the U.S. Forest Service (Region 6) established a snag management policy requiring Forests to develop guidelines to, "...provide [snag] habitat needed to maintain self-sustaining populations of snag-dependent wildlife species" (USDA 1975). In 1990, the Umpqua National Forest Land and Resource Management Plan modified this requirement and it was then amended by the Northwest Forest Plan in 1994. The intent of standards and guidelines in the Forest Plan for the Matrix land allocation is to provide a renewable supply of large snags and down logs well distributed across the landscape to maintain viable indigenous wildlife populations and ecological functions. It provides interim direction for levels of dead wood retention until the development and use of models allows for ecologically-based management prescriptions for coarse woody debris.

On January 19, 2001 a Memorandum of Understanding (MOU) was signed by the U.S Forest Service, Bureau of Land Management, National Park Service, Environmental Protection Agency, Bureau of Indian Affairs, U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively known as the Provincial Interagency Executive Committee - PIEC) to refine and implement coarse wood requirements for regeneration harvesting within the Southwestern Oregon Province. The intent of this MOU is to apply local models and information on coarse woody debris for regeneration harvests within the Matrix on a trial basis of 5 years. The objective is to implement the guidelines in the MOU on "at least one regeneration harvest unit per administrative unit" for new projects. The MOU contains various examples on the use of landscape stratification (e.g., plant association groups, topography, etc.) for developing recommendations for coarse wood management.

Data from Plant Association Group (PAG) tables used for down wood and snag guidelines for southwestern Oregon (in the MOU) help determine how much decay class 1 (hard) wood to leave after harvest. Decay rates and fall down rates were used to work forward in time to when the fire-killed stands will be 100 years old and beginning to once again produce large down wood to the forest floor. The desired condition in 100 years based on the PAG, and the retention levels needed to achieve the desired condition of adequate levels of Class IV and V snags and logs are described in Table 27.

Table 27. Desired condition of decayed snags and logs in 100 years by Forest Plant Association Group (PAG).

Forest Zone (PAG)	Snags/Acre	Down Wood Lineal Feet/Acre (>20" small end diameter)	Prescribed Standing Dead Snags/Acre (>26" diameter)
Douglas-fir	1	98	4
Dry Western Hemlock	2	504	15
Moist Western Hemlock	3	585	16
True Fir (White Fir)	3	607	16

A landscape-scale survey of large snags and logs was conducted shortly after the Apple Fire was contained (October-November 2002). This survey used the methodology described in a General Technical Report (GTR) by Bate et al. (1999). This GTR provides an efficient and accurate sampling technique for land areas between 1,000-20,000 acres in size. The results of this survey described the affected environment for coarse woody debris in detail (Davis 2003).

Potential Population Capacity

Current management direction requires, as a minimum, maintenance of cavity nesting species at or above 60% potential population capacity (PPC) for the planning area. Black-backed woodpeckers, a species closely associated with post-fire habitat, were recently observed in stand-replaced patches of the Spring Fire (burned in 1996) and within the 2002 Apple Fire during unit field recon. This species requires management at 100% PPC (ROD C-46). The management objective is to meet or exceed these standards within harvest units, with per-acre requirements (snags/acre) met on average areas no larger than 40 acres in size (Table 28).

TABLE 28. Forest Plan snag requirements and current levels. Current levels are higher than needed to maintain maximum potential population capability (100% PPC) for cavity-nesting birds according to the Umpqua Forest Plan (USDA 1990, Appendix B-73).

SPECIES	SNAGS/ACRE IN HARVEST UNITS				DBH (inch)	DECAY CLASS
	60% PPC	100% PPC	REQ'D	CURRENT		
Red-breasted Sapsucker	0.27	0.45	0.27	6.24 (15-16")	15+	HARD (1)
Black-Backed Woodpecker	0.07	0.12	0.12	19.42 (17-24")	17+	
Pileated Woodpecker	0.04	0.06	0.04	20.22 (≥25")	25+	
Downy Woodpecker	0.10	0.16	0.10	2.52 (11-14")	11+	SOFT (2&3)
Hairy Woodpecker	1.15	1.92	1.15	0.40 (15-16")	15+	
Northern Flicker	0.29	0.48	0.29	3.02 (≥17")	17+	
TOTAL (Snags/Acre) =	1.92	3.19	1.97	51.82		

Environmental Effects

Direct Effects

Harvesting of dead trees lowers the density of snags per acre that remain on the landscape. The minimum required snag retention within harvest units is 2 snags per acre, as two snags would be felled for large wood needs (Table 28). At least 0.43 snags per acre need to be hard snags (decay class 1) in order to provide for future down wood needs. To the extent practical and safe, all alternatives would leave existing soft snags within units. Figure 43 displays the percentage of trees per acre by retention level for each action alternative.

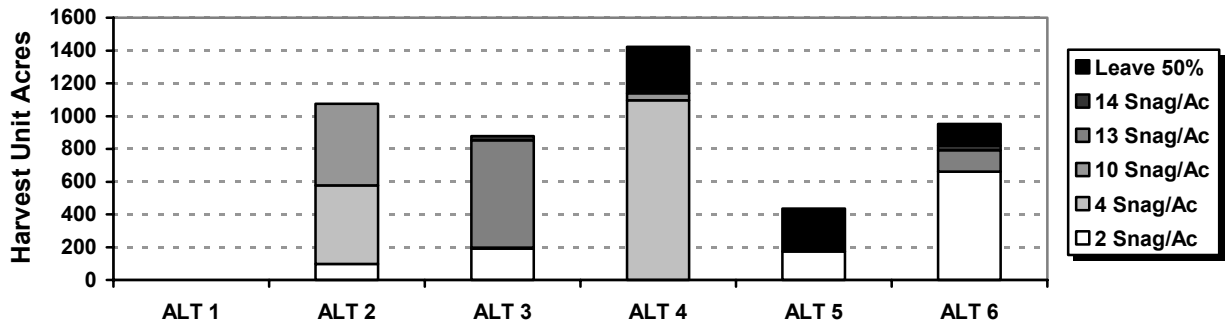


Figure 43. Comparison of leave tree (snag) retention by alternative. Two additional trees are left in all action alternatives, for felling after harvest and burning to provide ground cover. Leave tree density ranges from 4-16+ per acre.

All action alternatives would leave enough hard snags within harvest units to meet or exceed the minimum Forest Plan Standards and Guidelines and MOU requirements for hard snags and future soft snags. This would maintain populations of cavity nesters at the 100% PPC level. No other direct effects are expected to occur.

Indirect Effects

Indirect effects occur from unplanned falling of snags for reasons of safety or logging systems. The extent of this effect is impossible to predict, however, the higher the density of leave trees, the higher the risk to forest workers. This usually results in higher levels of falling snags for safety. In all alternatives, retention trees felled for safety or logging systems would be left on site as down wood. Alternative 4 has the highest acreage of hazard tree areas, followed by Alternative 5 and Alternative 6.

Cumulative Effects

To assess the cumulative effects, the snag densities (correlates to % PPC) were averaged for the entire planning area. This looks at the snag habitat within all successional stages and burn intensities. Figure 44 displays the mean snag levels retained by alternative and compares those levels to the density of snags required to meet 100% PPC.

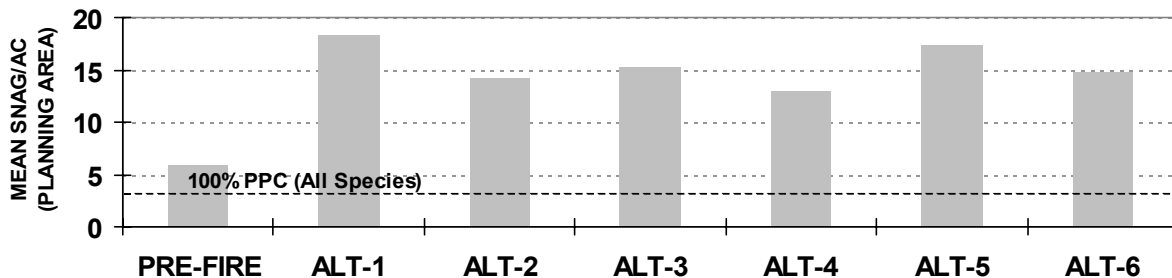


Figure 44. Comparison of mean snag/acre levels normalized for the planning area. Note that 3.19 snags/acre is equivalent to 100% PPC. All alternatives leave over 50% of the existing dead tree patches unsalvaged. Mean densities of snags are well above the number required to achieve maximum PPC.

The Apple Fire provided a “pulse” of snags that almost tripled the mean snag density for the planning area. Figure 45 displays the snag patches in the planning area prior to and after the fire, than displays the effects of the proposed activities on those snag patches. The proposed salvage impacts from 10-59% of this pulse, depending on the alternative. Of the action alternatives, Alternative 5 has the least cumulative impact on the overall PPC for the planning area, followed (in order of least to most impact) by Alternatives 3, 6, 2 and 4. Cumulatively, each alternative is above the 100% PPC level for the planning area. At the landscape scale, within 1-5 miles of the planning area, snags remain from the 2002 Limpy Fire, 2001 and 2002 Calf Creek Fires, the 1996 Spring Fire, and within the Late-successional Reserve that burned during the 2002 Apple Fire. No salvage has occurred and none is planned to occur on these fires. In addition, at a Forest scale, high densities of snags were created by the 2002 Tiller Complex Fires; currently only about 450 acres of salvage are proposed there.

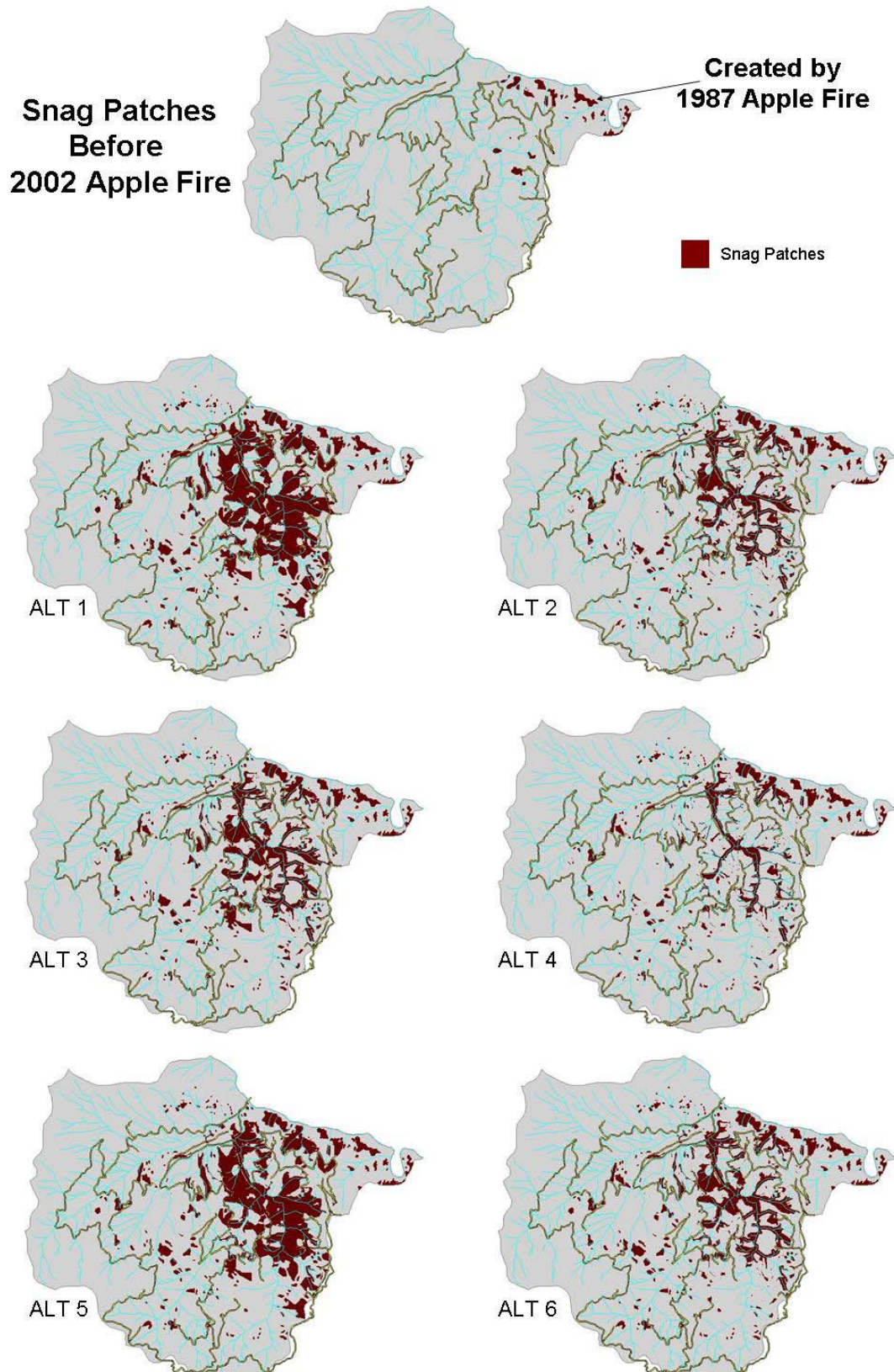


Figure 45. Dead forest patches containing high densities of large diameter trees (shown in brown). This figure shows the spatial distribution of dead tree patches which will not be salvaged by alternative. Harvest units contain from 4-58 dead trees per acre (units not shown in this figure).

DISTRIBUTION OF DEAD WOOD

Affected Environment

DecAID (a tool for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon) is a summary of the current knowledge and best available data on dead wood in Pacific Northwest ecosystems (Marcot et al. 2002). It provides guidance about how to manage for levels of dead wood using wildlife data and information from unharvested forest inventory plots. This data can be applied to management decisions at a range of spatial scales, from stand-level to across landscapes. Planning areas should be sufficiently large to encompass the range of variation in wildlife habitat types and structural conditions. As described under coarse woody debris, scoping identified the importance of maintaining snags in all diameter classes across the landscape. As a general rule-of-thumb, Marcot et al. (2002) suggest that planning areas be at least 20 square miles in size (12,800 acres). A reasonable objective is to manage for the range of conditions within the planning area, based on the DecAID data, rather than focusing on a specific wildlife species. Balancing high density areas of dead wood with moderate and low density areas may be desirable over a landscape (Marcot et al. 2002).

The Apple fire created a major change in local levels of dead wood (Figure 46). These changes are described in the Wildfire Effects Evaluation Project and Snag and Log Survey Report (USDA 2003).

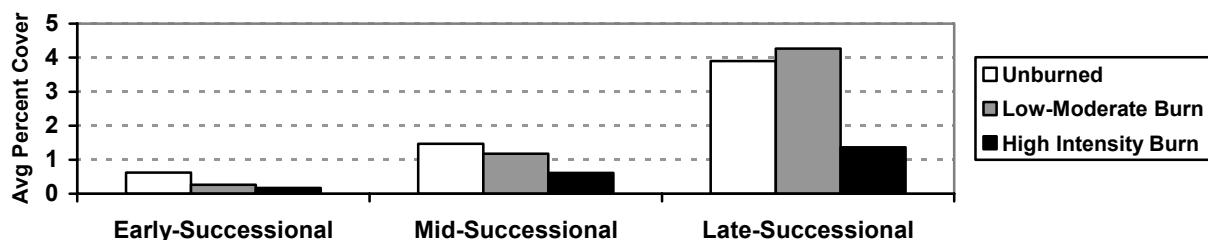


Figure 46. Post-fire changes in percent ground coverage of down wood from the snag and log inventory (only down wood ≥ 16 inches diameter at small end and ≥ 16 feet in length were inventoried).

Data from the large snag and log inventory (Davis 2003) was used to generate down wood percent ground coverage (a management index used by DecAID) within the planning area. Figure 46 shows current cover estimates for larger diameter (≥ 16 inches diameter) down wood; DecAID provides recommendations based on down wood ≥ 5 inches diameter. Based on general field reconnaissance, there is a significant amount of smaller diameter material in the unburned mid to late-successional and low-moderately burned late-successional areas; this material is lacking in the most intensely burned areas.

Environmental Effects

Direct Effects

DecAID recommends leaving a minimum of 2.3% dead wood coverage at the stand level for early-successional conifer stands in the western Cascades of Oregon. This percentage includes down wood, standing snags and live trees. DecAID uses taper equation information (Flewelling Profile Model in FVS) to estimate the percent coverage a tree (or snag) provides up to a 5 inch top. Based on data from the snag inventory and the average

size of trees to be left after salvage, each leave tree would provide approximately 0.3% cover per acre. In other words, leaving 4 trees per acre provides about 1.2% cover for the unit. Each action alternative leaves from 4-58 trees per acre (more in some units in Alternatives 5 and 6); this equates to 1.2%-17.4% increase in current levels of down wood coverage. The current average percent coverage within harvest units is 1.4% (Figure 46). Therefore, all alternatives would leave greater than 2.6% coverage (current levels plus cover provided by retention trees) after harvest and slash burning. Figure 44 graphically displays the levels of leave tree retention in each alternative.

The Northwest Forest Plan (ROD C-40) requires leaving a minimum of 120 linear feet of decay class 1 and 2 (hard) logs per acre greater than or equal to 16 inches in diameter and 16 feet long. The Umpqua National Forest LRMP (IV-69) requires leaving greater than 250 linear feet of decay class 1-3 large woody material greater than 20 inches in diameter (dbh) and greater than 10 feet in length following regeneration harvests or catastrophic salvage. Of this amount, 60% may be left as "standing wood". The retention of 4-58 trees per acre (varies with alternative) and the falling of 2 trees (greater than 26 inch dbh) per acre would meet or exceed these standards and guidelines. All alternatives meet or exceed forest plan standards and guidelines. Therefore, no direct effects to species that use this habitat are expected to occur.

Indirect Effects

Prescribed fire during slash disposal would likely consume some of the existing coarse woody debris, mostly the pieces in the later stages of decay (decay class 4 and 5). This would reduce the percent ground cover. Fire is expected to burn in a mosaic pattern, leaving some areas unburned. Overall, burning prescriptions would require the retention of 85% effective ground cover to minimize effects to soil. This management requirement would also help maintain coarse wood across the landscape. Alternative 1 has no indirect impacts. Of the action alternatives, Alternative 4 has the greatest indirect impact on coarse woody debris because it burns the most slash, followed in order from greatest to lowest impacts, are Alternatives 2, 6, 3, and 5. The indirect impacts from the action alternatives would not cause coarse woody debris to fall below Forest Plan standards and guidelines or levels recommended in DecAID.

Cumulative Effects

Cumulative effects on coarse woody debris are analyzed over time (the next 100 years) and also at the planning area scale. To determine the trend in dead wood levels over the next century, decay rate and snag fall down rate information from the Coarse Wood Dynamics Model (Mellen and Ager 2002) were used. The equations in this model are based on data from the western Cascades. In conjunction with data from Plant Association Group (PAG) tables used for down wood and snag guidelines for southwestern Oregon (in the MOU) to determine how much decay class 1 (hard) wood to leave after harvest, the equations were applied to achieve PAG inventory levels of decay class 4-5 down wood in the future. These levels were also compared to nearby data collected from the Little River Adaptive Management Area (AMA), which lies to the south of the planning area (Figure 47).

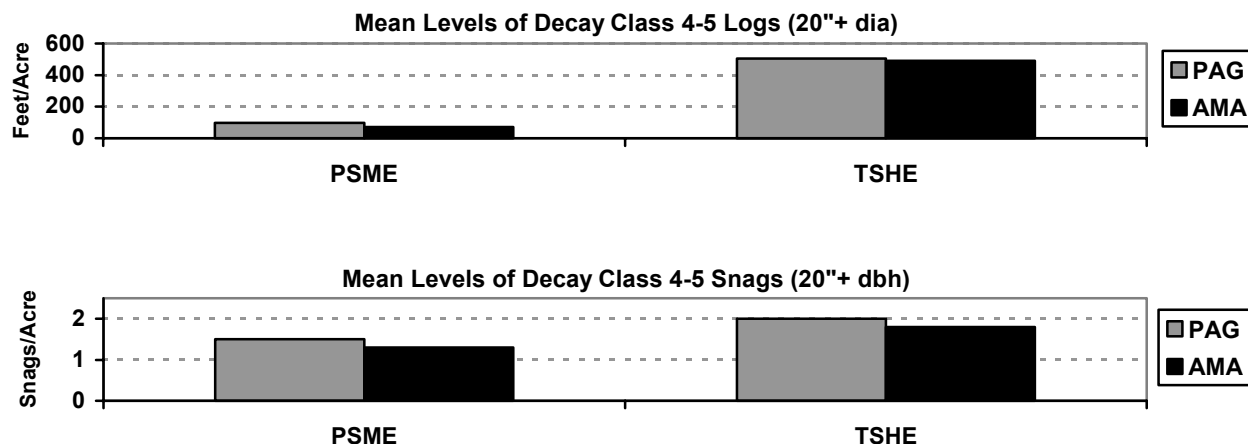


Figure 47. Mean decay class 4-5 snag and log levels for the two main plant association groups (PAG) that presently occur in the planning area and harvest units (PSME = Douglas-fir; TSHE = western hemlock). Comparison of PAG data and Little River AMA inventory data is shown.

Retention trees left after harvest as snags or felled as logs would slowly decay and fall down over time, eventually making up the decay class 4-5 component within the future stands once the salvage units have grown back into late-successional habitat. The majority of the salvage units fall within Douglas-fir or western hemlock PAGs. The data indicates that 2 leave trees are needed in the Douglas-fir PAG and 15 leave trees are needed in the western hemlock PAG to achieve appropriate levels of decay class 4-5 material in the future late-successional stands. All action alternatives meet or exceed the required amount of tree retention needed to maintain adequate levels of coarse woody debris over time, as the stands develop.

At the planning area scale, data from DecAID and the Middle North Umpqua Watershed Analysis indicate that high density dead wood patches covered anywhere from 4%-12% of the area over time. This level fluctuates with stand development and disturbance events (e.g., wildfire or blowdown). The MOU for coarse woody debris management in southwest Oregon suggests retaining areas that have high amounts of dead wood. It states that these areas are ecologically important and that they average around 15% of a 6th-field watershed (MOU pg. 3-4). Figure 48 shows the cumulative impacts each alternative has on dead wood patches at the planning area scale.

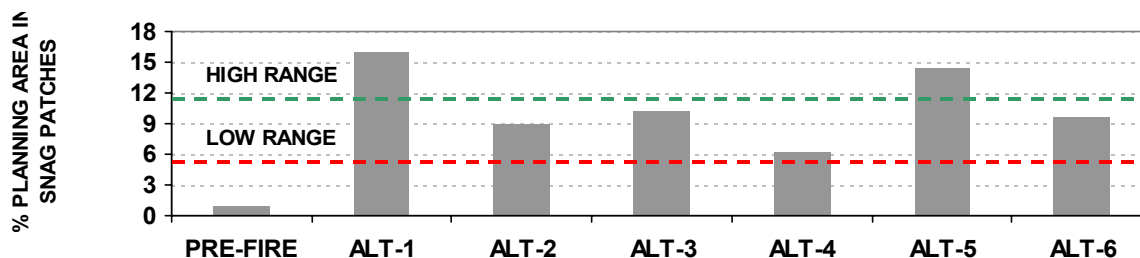


Figure 48. Comparison of landscape levels of high density (snag/acre) dead tree patches/habitat left in the planning area in relationship to the estimated range of natural variability.

All alternatives maintain or exceed the estimated natural range levels for dead tree patch retention for the planning area.

EFFECTS ON SENSITIVE WILDLIFE SPECIES

Affected Environment

A pre-field review was performed to determine which sensitive species are most likely to be impacted by the proposed action. Table 29 summarizes the presence or absence of sensitive species and/or their habitat within or adjacent (in terms of potential impacts - e.g., noise) to the actual proposed ground disturbance areas. It is based on the latest documented survey and sighting data, scientific literature review and GIS analysis. Impact or effect determinations are made on each species, based on this review. If an impact or effect is anticipated, further analysis and discussion is provided in the following section. The results of this review are found in detail in the Wildlife Biological Evaluation in the Project Record and are summarized below.

Table 29. Pre-field review and biological evaluation summary. Species for which an impact or effect is anticipated are shaded in gray.

Common Name	Habitat Present In or Adjacent to Proposed Units		Species Present In or Adjacent to Proposed Units		Impact/Effect Expected		Conservation Strategy or Recovery Plan		Loss of Viability or Trend	Comments
	In	Adjacent	In	Adjacent	To Habitat	To Species	Type	Consistent		
Northern Spotted Owl	NO	YES	NO	YES	YES	YES	Northwest Forest Plan	YES	NO	See species discussion
Bald Eagle	YES	YES	YES	YES	YES	YES	Pacific Bald Eagle Recovery Plan	YES	NO	See species discussion
Peregrine Falcon	YES	YES	PROBABLE	YES	YES	YES	Pacific Coast Recovery Plan	YES	NO	See species discussion
Harlequin Duck	NO	YES	NO	YES	NO	NO	NONE	N/A	NO	Nesting could occur along the North Umpqua River. Nearest sighting is 1.5 miles from nearest unit (1998 near mouth of Calf Creek). No project activities occur within the Wild & Scenic River Corridor or bottom 0.5 mile of Panther Creek. Far enough away from project to not be a concern.
Bufflehead	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	Nests along lakes and ponds. North Umpqua River may be a travel corridor. No activities are proposed in the river corridor. No ponds or lakes occur within the planning area, which is in deeply dissected, steep and dry terrain. Very unlikely to occur in planning area.
Yellow Rail	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	Nearest population is Klamath Lakes. Nests in large wetlands and marshes. There is none of this habitat in planning area near the proposed salvage units. It is very unlikely that this bird occurs in the planning area.
Oregon Spotted Frog	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	No documented occurrence of this frog in Douglas County. Its habitat does not occur within the planning area. It is very unlikely that this frog occurs within the area proposed for salvage. No ponds or wetlands are present.
Foothill Yellow-legged Frog	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	Known to occur 7 miles from planning area, in adjacent Little River watershed. Also 15 miles down North Umpqua River. Mainly occurs at lower elevations in warmer stream systems. No activities within river corridor, streams are buffered. Unlikely to occur in area.
Southern Torrent Salamander	NO	YES	NO	YES	YES	YES	Northwest Forest Plan	YES	NO	See species discussion
Western Pond Turtle	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	Known to occur 2 mi. from planning area, in adjacent Little River watershed. Also 20 miles down North Umpqua River. No activities are proposed within the river corridor. No pond or slow water habitats within or adjacent to units. Very unlikely this species occurs in planning area.
Common Kingsnake	NO	NO	NO	NO	NO	NO	NONE	N/A	NO	Potentially could occur within the North Umpqua River corridor. There are no proposed activities within this corridor. No salvaging is proposed in natural oak meadows or rocky talus openings. Very unlikely this species occurs within the planning area.
Canada Lynx	NO	NO	NO	NO	NO	NO	Conservation Assessment & Strategy	N/A	NO	Very unlikely to occur in planning area. Interagency lynx biologists recommended that land management guidelines in the <i>Canada Lynx Conservation Assessment and Strategy</i> not be applied west of the Oregon Cascade Crest.
California Wolverine	NO	NO	NO	POSSIBLE	NO	NO	NONE	N/A	NO	Although it may possibly travel through or near the planning area, no critical habitat (e.g., denning) occurs in planning area. Wolverines can easily avoid the planning area during project activities. The planning area is not along important travel corridors.
Pacific Fisher	NO	YES	NO	POSSIBLE	NO	NO	Northwest Forest Plan	YES	NO	Presence is assumed, see species discussion
Pacific Fringed Myotis	YES	YES	PROBABLE	PROBABLE	YES	YES	Northwest Forest Plan	YES	NO	Presence is assumed, see species discussion
Pacific Pallid Bat	NO	NO	NO	NO	NO	NO	Northwest Forest Plan	YES	NO	This bat is a ground feeding bat that needs open rocky, grassy areas for foraging. Normally occurs in lower elevations and arid climates. Very unlikely that this species occurs in the western hemlock/Douglas-fir forest types in the planning area.
Pacific Shrew	NO	YES	NO	PROBABLE	YES	YES	Northwest Forest Plan	YES	NO	Presence is assumed, see species discussion

Northern Spotted Owl (*Strix occidentalis caurina*)

Affected Environment

Nesting, roosting, and foraging habitat (NRF) for the spotted owl usually occurs in late-successional coniferous forests stands with large conifers and snags (>32 inches d.b.h.), trees with broken tops, large branches or cavities for nesting, a multi-layered closed canopy that facilitates thermal regulation and protection from predation and adequate amounts of large dead wood on the forest floor to support populations of prey (small mammals). Large contiguous blocks of NRF habitat are necessary for nesting success and survival. Within the southern Cascades, a 1.2-mile radius circle around an owl nest or activity center represents its home range. Forty percent NRF within 1.2 miles (1,182 acres) is considered the minimum acceptable amount of home range habitat for long-term owl survival. Areas “critical” to the recovery of the spotted owl (critical habitat units) were designated by the US Fish and Wildlife Service (under the ESA). There are no designated critical habitat units within the planning area.

Dispersal habitat for spotted owls satisfies needs for foraging, roosting and protection from predators and is characterized by forests that have a minimum average tree diameter of 11 inches dbh. and $\geq 40\%$ canopy cover. Maintenance of dispersal habitat on a minimum of 50% of federal lands within a given area (e.g., planning area, sub-watershed or quarter-township) is a conventional threshold utilized to evaluate adequate dispersal habitat conditions.

The planning area contained about 8,678 acres of NRF habitat before the 2002 Apple Fire, but now contains around 5,471 acres. Of this, about 61% was underburned by the fire. The amount of dispersal habitat before the Apple Fire was above 50% for the land area within the planning area, but is now around 43%. Much of the Limpy and Bachelor Creek drainages are no longer suitable owl NRF habitat. Overall, the 2002 Apple fire created a large gap or “hole” in spotted owl NRF habitat within the planning area. It is in this “hole” that the proposed salvage is mainly focused, although some harvest units occur along the edges of remaining habitat. A dichotomy exists in where interior mature and old forest habitat seems important to owl survival; however convoluted edges between this habitat and younger forest habitats seem important to reproductive outputs (Franklin et al. 2000). Habitat fitness appears to be highest for owls with home ranges that consist of a mosaic of young forest habitat types interspersed within a matrix of old and mature forest. Areas where the fire created patches of early-successional habitat scattered throughout the older forests, such as in the moderate landscape area of Panther Creek, may actually be beneficial to the owl. For further discussion of the 2002 wildfire effects to spotted owls and their habitat on the Umpqua National Forest, the reader is referred to the Wildfire Effects Evaluation Project report (USDA 2003).

There are four spotted owl activity centers within the planning area. Three are owl pairs and one is a resident single. The 2002 Apple Fire decreased the amount of habitat to less than 40% within one of the three owl pair home ranges (MSNO #710). The other home ranges have >40% NRF habitat (including the resident single). Owl pair 710 may shift its home range towards the west where the resident single owl resides (MSNO #520). Core areas were delineated around the four activity centers in 1995, to include at least 100 acres of the best nesting habitat (ROD C-10). Areas around these core areas are to be managed to reduce risks of natural disturbances such as wildfire (ROD C-45). The proposed project avoids these areas, however; the fire burned through 3 of the 4 core areas, causing some loss of NRF habitat within them.

At a range-wide scale, spotted owl populations have been monitored since the mid-1980s. There are 8 Demographic Study Areas (DSAs) located throughout the range of the owl. These DSAs are long-term study areas designed to assess trends in spotted owl populations and habitat as directed under the Northwest Forest Plan (USDA/USDI 1994). A range-wide analysis of spotted owl population data in 1998 showed an annual decrease of about 3.9% for territorial females across their range (Franklin et al. 1999). More recent reports discuss significant declines in spotted owl populations in the northern portions of their range (e.g., Olympic Peninsula and Cle Elum, Washington). The reason for the decline is unknown, but may be related to the invasion of the area by barred owls (*Strix varia*), which currently outnumber spotted owls in that portion of the range (Forsman et al. 2002).

To assess the population trends on and around the Umpqua National Forest, data from four DSAs that surround the forest were used. These DSAs are the Tyee (located 27 miles west of the Forest), HJ Andrews (15 miles north of the Forest), Klamath (directly adjacent and southwest of the Forest) and the Southern Cascades DSA (directly adjacent and southeast of the Forest).

Owl populations appear stable in the Tyee DSA (Forsman et al. 2002). Although there are a few cases where spotted owls have been displaced by barred owls within this DSA, there is little evidence that increasing presence of barred owls is causing the spotted owl population to decline (Forsman et al. 2002).

In the HJ Andrews DSA, single owl occupancy has remained stable since 1995 although pair occupancy seems to have gradually declined since 1989. Continued losses of pairs would negatively impact productivity and may accelerate the rate of population decline. The data suggests that barred owls are becoming increasingly common in the study area and several pairs of spotted owls have been either displaced or are inhibited from responding (Anthony et al. 2002a).

The spotted owl population within the Klamath DSA appears to be stable to slightly declining (Lint et al. 2002, Pers. Comm, Joe Lint). The barred owl population in 2002 was about 6% of the total adult spotted and barred owl population in this DSA.

In the Southern Cascades DSA, the percentage of historic territories with both spotted owls and barred owls or barred owls only has increased from 3.3% to 17.3% (Anthony et al. 2002b). The percentage of sites occupied by northern spotted owls (including territorial pairs) has declined since 1992.

Environmental Effects

Direct Effects

Habitat loss is the primary factor impacting Northern Spotted Owl survivability (Forsman et al. 1984). The proposed project focuses salvage on the most severely burned stands within the planning area and salvages only dead trees. The majority of the salvage units are in stand-replaced NRF habitat, which are no longer considered suitable spotted owl nesting habitat. However, a few of the proposed units in some of the alternatives have enough green conifers (that survived the fire) in them that they might still function as NRF and/or dispersal habitat. Some units are also located directly adjacent to underburned NRF habitat. Salvage logging operations may cause further impacts and degradation to these NRF areas through alteration of stand structure and prey species habitat. The magnitude of these impacts is similar to those described for late-successional habitat. Figure 40 graphically shows a comparison of degradation effects to NRF habitat.

Alternative 1 has no direct impact. Of the action alternatives, Alternative 6 has the least amount of impact. Alternative 4 has the largest impact, followed (in terms of most to least impact) by Alternatives 5, 2, 3 and 6. Overall, the action alternatives impact a small proportion (0.6% to 2.5%) of the remaining NRF habitat within the planning area.

Non-habitat disturbing activities (e.g., hiking, recreation, etc.) are thought to be relatively insignificant threats (USDI 1995). Studies recently completed, and ongoing (Delaney et al. 1999 and Delaney and Grubb, ongoing research) indicate that this may be the case. Mexican spotted owls (*Strix occidentalis mexicana*) did not exhibit adverse nesting behavior, or significant reductions in reproductive success when exposed to sound stimuli from military helicopters and chainsaws (Delaney et al. 1999). Owls did not flush during incubation. When exposed to these noises, the owl did flush after juveniles left the nest and if the noise was within 105 meters. The birds quickly returned to pre-disturbance behavior within 10-15 minutes of the disturbance. The existing scientific data indicates that noise-disturbance results in insignificant effects that may affect, but would not likely adversely affect the spotted owl. However, it is standard operating procedure for US Fish and Wildlife Service (USFWS) regulatory agency biologists to assume (until proven otherwise) that human-caused noise disturbance during the early part of the owl's nesting season (March 1 - July 15) causes adverse effects to spotted owls by disrupting their nesting behavior. Therefore, it is assumed that the disturbance from the proposed activities would negatively affect spotted owls.

Because timber harvesting and associated activities would occur during the nesting season for the owl, potential disturbance effects were analyzed using standard distance buffers prescribed by USFWS to determine noise disturbance in this Region. A quarter-mile buffer was generated along all commercial use roads and harvest units, a 0.5 mile buffer was created around all helicopter landings and service areas as well as harvest units designated for helicopter logging and a 1.0 mile buffer was created around quarries where blasting of rock would likely occur (Figure 49). These buffers were combined and then overlaid on activity centers and NRF habitat to quantify the potential effect of noise disturbance.

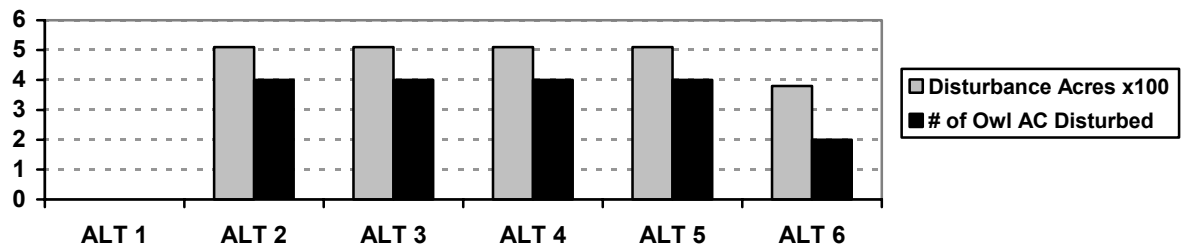


Figure 49. Comparison of potential noise disturbance effects caused by timber harvesting and related activities. Alternatives 2-5 may cause disturbance to all four owl activity centers (AC), whereas Alternative 6 may impact only two.

Alternative 1 has no direct impact. Alternative 6 has the least potential for disturbance, because it concentrates the salvage activities to a portion of the planning area that is mostly devoid of owl habitat and it eliminates log hauling along the 4714 road. Alternatives 2-5 have similar impacts and potentially disturb more owls (4 activity centers) and NRF habitat than Alternative 6.

Indirect Effects

Altering the structure and levels of dead wood within and adjacent to NRF habitat may cause indirect effects to the owl by altering the owl's prey base. Again, the potential magnitude of this effect in NRF habitat is shown in the late-successional effects discussion (Figure 40). However, site specific levels of dead wood are highly variable in amounts and distribution (White et al. 2002). It is not unnatural to find areas devoid of down wood, while in other areas "jackpots" or large clumps of wood occur. Even though levels of dead and down wood would be reduced in harvest units, dead tree retention in Riparian Reserves and other unharvested areas provide appropriate levels of prey habitat within the planning area. The no action alternative would have no indirect impacts to the owl. The action alternatives would alter levels of prey species habitat and cause indirect impacts. However, all alternatives maintain levels of dead wood that are within the natural range of variation for the planning area and it is assumed that this would be sufficient to maintain a suitable prey base (USDA 2001). Therefore, this indirect impact is not considered adverse.

Cumulative Effects

Habitat loss is the primary threat to the spotted owl and as such is the most relevant potential cumulative effect to consider. Present and reasonably foreseeable actions that degrade or remove owl habitat in the vicinity of the project area include North Umpqua trail reconstruction, roadside hazard tree falling, the Apple Seed Project and fire salvage in Tiller. Habitat modification associated with the proposed project and the ongoing and foreseeable activities are of such limited scale that they are considered minor contributions to the cumulative effect of habitat loss and mainly alter/degrade habitat.

The main effect to the owl in this area was from the 2002 Apple Fire (USDA 2003). Future fires also pose a significant threat to owls and their habitat. Based on fire modeling (FARSITE), the no action alternative has the potential to create a higher risk of larger fires into the future, resulting in future loss of habitat or setback in forest succession and re-development of habitat (Figure 50).

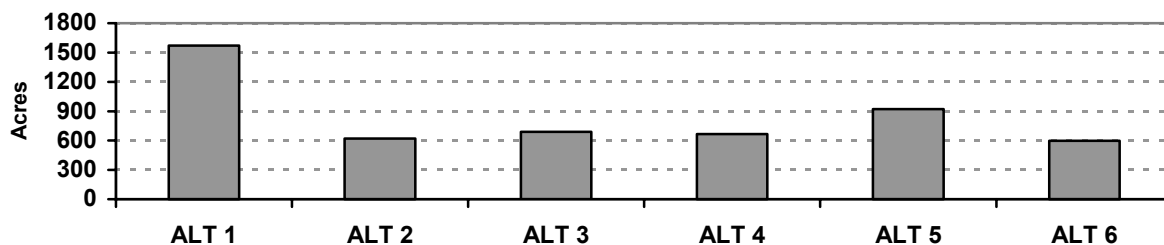


Figure 50. Comparison of potential future habitat loss and cumulative effects from future fire as modeled by FARSITE.

The no action alternative has the highest potential for cumulative effects on the spotted owl; FARSITE indicates a higher risk and a larger wildfire and loss or "set-back" of habitat in the future. Alternative 5 has the next highest risk, followed by (in order of highest to lowest risk and acreage burned) 3, 4, 2 and 6.

At a range-wide scale for the owl, the Northwest Forest Plan analyzed historic activities that resulted in owl habitat loss. It also predicted future impacts to the species (e.g., timber sales, wildfires, etc.) and incorporated these impacts into the species viability

assessment for the owl. Management in accordance with the standards and guidelines of the Northwest Forest Plan greatly reduces the likelihood that present and future activities would result in a significant cumulative effect to the species. The proposed project is consistent with standards and guidelines in the Northwest Forest Plan and recommendations from the watershed analysis. Thus, the habitat loss from salvage activities is not considered to be of a significant threat to the species.

Effects Determination

Following consideration of the direct, indirect and cumulative effects of the proposed activities and based on input from the local USFWS level one team wildlife biologist, it is determined that all of the proposed alternatives “may affect, and likely adversely affect” the northern spotted owl through noise disturbance. The no action alternative “may affect, and likely adversely affect” the owl if a future large-fire does occur, but there would be no disturbance from noise. There is “no effect” to critical habitat because the project is outside of designated critical habitat units.

Northern Bald Eagle (*Haliaeetus leucocephalus*)

Affected Environment

This large eagle primarily nests in forested areas near large bodies of water and along rivers (Marshall et al. 2003). All nests in Oregon occur mainly in prominent, live conifer trees (primarily Douglas-fir in the western Cascades). The nest is constructed of large sticks and is usually reused each year. They are opportunistic feeders, but prey mainly on fish. If food is abundant year-round, they are known to become resident, otherwise they wander in seasonal migrations to find food (Marshall et al. 2003). Egg-laying occurs from mid-February to late April. Juveniles are usually fledged from June to August.

Bald eagles were placed on the Endangered Species list in 1978 due to a reduction of numbers caused by DDT and other pesticides in their food supply. Since that time recovery of the eagle has been strong throughout the nation. At the landscape scale, available information indicates that bald eagle populations are increasing range-wide. In the Pacific Recovery Region, the number of occupied territories has consistently increased since 1986. Eagle productivity goals for the Recovery Region have been met since 1990, but distribution and nesting goals for some Recovery Zones within the Recovery Region have not been met (USDI 2003).

In Oregon, for the 1998- 2002 time period, the state-wide population, distribution, and productivity goals were met. Eight out of ten Recovery Zones met or exceed their population goals and thus attained the 80% distribution level identified in the recovery plan. The state-wide average for productivity exceeded the goal of 1.0 young fledged per pair. However, some Recovery Zones were still below this goal (Pers. comm., Frank Isaacs).

The planning area is located within the California/Oregon Coast Recovery Zone (#13). During the 1998-2002 time period, all recovery plan goals for this zone were met. The population goal for Recovery Zone 13 is 45 occupied territories; in 2002 there were 83 occupied territories. The productivity goal is 1.0 young fledged per pair; from 1998-2002, the five year average productivity rate was 1.07 (Pers. comm., Frank Isaacs).

Historic sighting data indicate that bald eagles forage along the North Umpqua River from November through February; however, recent observations concentrated near the confluence of Steamboat Creek and the river suggest the presence of a breeding pair in that area. Although there are no nests within the planning area, three observations of bald eagles have been documented within or directly adjacent to it. Two of these observations occurred in 2003. One eagle was observed perching in a snag along the south bank of the North Umpqua River within a burned forest stand and the other was observed flying over Fairy Creek, which is within the planning area and is about 1.5 miles from the river.

Environmental Effects

Direct Effects

Management considerations for bald eagles from the Northwest Bald Eagle Recovery Plan are to prohibit logging of known nest trees or snags, perch trees/snags, and winter roost trees/snags. There are no nests or consistently used perch or roost trees/snags within any of the proposed salvage units. All potential salvage units within the Wild and Scenic River Corridor were dropped from consideration for harvesting. This corridor is the most heavily used area of the planning area by bald eagles.

Potential direct effects of this project on eagle habitat are limited to falling of potential nesting or roosting trees. Because of the distance from the river, and the protection afforded the Wild and Scenic River Corridor, it is less likely that eagles would nest in the proposed project area (vicinity of the units). In addition, eagles usually nest in green trees and very few green trees would be felled (incidental to harvesting) by the proposed salvage.

Recent observations of adult and juvenile bald eagles near Steamboat Inn indicate that a bald eagle nest may be in the vicinity of the planning area, approximately 4-5 miles to the northwest near the mouth of Steamboat Creek. Above-ambient noise levels associated with project work may have the potential to disturb or temporarily displace eagles, if they are roosting or foraging within close proximity to the activity. Project activities would occur over one mile away from the suspected nest area. Protection of the Wild and Scenic River Corridor also minimizes or avoids disturbance impacts. Due to these reasons, disturbance is considered to be an insignificant and/or discountable effect to bald eagles under all action alternatives.

Indirect Effects

Fish are a primary prey item for bald eagles and any current or future impacts to fish that result from this project would indirectly affect bald eagles. According to the Fisheries Biological Evaluation, the action alternative's effects to adult fish are considered to be minor and not likely to adversely effect their populations. This is expected to have no detectable or meaningfully measurable effect on bald eagles and thus is considered to be insignificant.

Cumulative Effects

Present and reasonably foreseeable actions that affect the eagle or its habitat in the project area vicinity include the reconstruction of the Calf segment of the North Umpqua Trail. Habitat modification associated with this future proposed project could potentially have more impact on the eagle since it occurs within the river corridor. However, it is an impact on a limited scale that would not create major structural changes to the river

corridor forest. The cumulative effects of the action alternatives to eagles and their habitat are considered insignificant.

Effects Determination

Following consideration of the direct, indirect and cumulative effects of the proposed activities as described above, it is determined that the action alternatives “may affect but is not likely to adversely affect” the northern bald eagle and its habitat. The no action alternative would have no short-term effect on this species, but maintains a higher risk of wildfire in the future and therefore has indirect impacts to the eagles prey (fish). However, this affect is not likely to be adverse.

American Peregrine Falcon (*Falco peregrinus anatum*)

Affected Environment

This bird is a long distance migrant that ranges from Mexico to Alaska. It nests on tall (usually greater than 75 feet) cliffs with ledges or potholes and usually lays from 3-4 eggs in late March to early April. Chicks are usually fledged by late July. It preys on small to medium sized birds, such as Stellar’s jays, woodpeckers, flickers, pigeons and shorebirds. This bird has high site fidelity and commonly uses the same nest ledge (eyrie) year after year. During the nesting season it becomes easily agitated by human-caused disturbances within close proximity to the eyrie (< 0.25 miles).

The near total disappearance of this raptor from much of the United States caused its listing in 1970 under the Endangered Species Conservation Act of 1969 (pre ESA). Subsequent recovery efforts have established over 2,000 breeding pairs across the United States and about as many unpaired “floaters” across their range (White et al. 2002). As a result, the peregrine falcon was removed from the Federal List of Endangered and Threatened Species (List) on August 25, 1999, but remains on the Regional Forester’s sensitive species list. In addition, the falcon is still protected under the Migratory Bird Treaty Act of 1918 (USDA 1999).

The ESA requires that recovered species removed from the List be monitored for not less than 5 years. A national monitoring plan was developed and implemented in 2003. The monitoring plan requires that surveys be conducted every 3 years, for a total of five surveys. Monitoring includes the collection of information on population trends and nesting success. At the conclusion of the monitoring program, a determination on the status of the falcon will be made.

The planning area is within the Pacific Region survey area (Washington, Oregon, California, Idaho and Nevada). There are 30 national monitoring sites in Oregon. Results from the first year’s monitoring effort indicate that 77% of the sites were occupied and that 61% of these were successful in reproduction of offspring. Twelve new sites were also discovered in Oregon in 2003. Preliminary results from the 2003 survey indicate that the nesting population is increasing in Oregon (Pers. comm. Frank Isaacs).

There are no known peregrine eyries or sightings within the planning area. However, portions of two adjacent falcon management zones extend into the planning area. Forest Service management direction (Regional Direction Letter dated August 25, 1999) states that if a proposed project may potentially impact the species or its habitat, protocol surveys should be conducted and nest site management plans used to guide activities

within primary, secondary and tertiary management zones. Surveys conducted in 2003 show presence at both sites and successful reproduction at one eyrie.

Environmental Effects

Direct Effects

Peregrine habitat on the Umpqua National Forest is managed in accordance with the Recovery Plan for American Peregrine Falcon (USDI FWS 1982) and Standards and Guidelines of the Land and Resource Management Plan for the Umpqua National Forest. Seasonal restrictions are usually applied to projects occurring within close proximity of the nest ledge (primary management zone). The planning area and proposed salvage units do not occur within primary management zones for either of the two sites that extend into the planning area.

Because of the distance from known eyries, none of the action alternatives cause disturbances near eyries and do not directly impact the falcon's nesting habitat. All alternatives would have no direct effects to this species.

Indirect Effects

The planning area and proposed units occur within the tertiary management zone for the two sites. According to the site management plans, tertiary zones are to be managed to provide foraging habitat for the falcons. Foraging habitat within the tertiary zone should provide for a variety of vegetative conditions both spatially and temporally (Draft Umpqua National Forest Peregrine Falcon Management Plan). Managing for high densities of snags is one goal for forage habitat within this zone. At a minimum, snags should be managed to provide for the maximum (100% PPC) population potential for cavity-nesting birds within the area, as described previously. Retention of snags created by wildfire in patches across the landscape and managing the landscape successional-stages within the natural range of variability would result in appropriate levels of prey species for this bird.

Altering early-successional habitat structure would have indirect effects on the falcon through changes caused in its prey base. However, this is expected to be minimal, because the falcons main prey are caught in flight above ground. Most bird species related to shrubby, grass/forb habitats that may be affected by planting stay near ground level and do not serve as prey for the falcon.

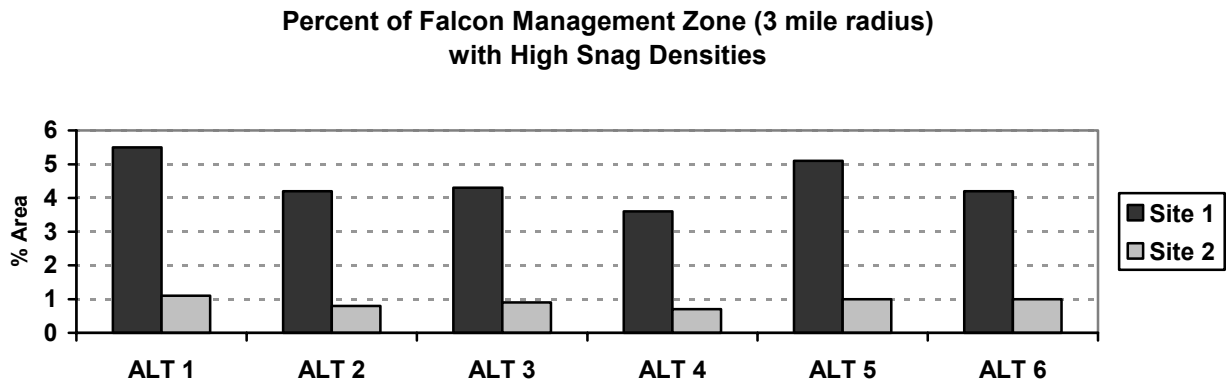


Figure 51. Comparison of percent area with dead tree patches (unsalvaged fire-killed forest stands) within the falcon management zones (3 mile radius) for both falcon sites (Sites 1 and 2).

The 2002 Apple Fire had a large effect on the prey base for these falcon sites through the creation of dead tree (snag) patches. The draft Umpqua National Forest falcon management plan recommends that some percentage (yet to be determined) of dead tree patches be maintained over time within falcon management zone. Figure 51 compares the change in percentage of area that contains dead forest patches within management zones (the area within a 3 mile radius of the eyrie). The no action alternative retains the highest amount of this habitat, while Alternative 4 retains the least. The main impact from the proposed action is on Site 1, but all alternatives maintain between 3.6%-5.4% of dead tree habitat within that management zone (Figure 43). The spatial distribution ranges from 0.7%-1.1% for Site 2. However, in both management zones, the amount of dead tree habitat has been increased from previous levels because of the fire. All action alternatives impact the peregrine falcon's foraging habitat, but retain patches of dead trees within the management zones (within their natural range as discussed in previous sections). Therefore, all action alternatives would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or the species.

Cumulative Effects

The effects of the wildfires have a greater influence on this species than the effects of the salvage. Forest-wide, there are approximately 5,847 acres of the prey species' habitat created by the 2002 wildfires (dead tree stands), located within 8 different falcon management zones. Of this, approximate 20% is proposed for salvaging in the foreseeable future. The remaining 80% would remain unsalvaged and function as good prey habitat for this species. As a result, local populations may increase over the next decade.

Impacts Determination

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that the action alternatives "may impact individuals or habitat but is not likely to contribute to a trend toward federal listing or loss of viability of the species" for all alternatives. The no action alternative has no short-term impact, but maintains a higher risk of wildfire in the future and therefore future impacts to foraging habitat.

Southern Torrent Salamander (*Rhyacotriton variegatus*)

Affected Environment

This species occurs in small, cold (usually 46°-55°F), and clear, coniferous forest streams, springs and seeps with gravel-dominated substrates and low sedimentation (Nussbaum et al. 1983, Good and Wake 1992, Leonard et al. 1993). They have been reported from near sea level (Nussbaum et al. 1983) to 4,800 feet elevation (Hunter 1998), but the upper elevation range on the Umpqua National Forest appears to be around 3,550 feet (local survey data). Usually, this salamander is not found more than a few meters away from streams (Nussbaum et al. 1983). However, observations of adults have occurred up to 165 feet from water (Good and Wake 1992, Vesely 1997).

The southern torrent salamander is still present throughout its historic range, but most of its range has undergone large-scale road construction and timber harvesting and localized extirpations, and reductions in abundance are believed to have occurred (USDI, USFWS, Federal Register, 29 June 1995; USDI 2000).

There are currently 20 known sites of this species on or near the Umpqua National Forest. No southern torrent salamanders were found during field reconnaissance, however many other species of salamanders were found (e.g., ensatina, Dunn's and clouded). A historical torrent salamander site does occur within the planning area in a small seep which crosses the North Umpqua Trail and flows into the North Umpqua River. This site is within the Wild and Scenic River corridor and is not near (>0.25 miles) any proposed salvage unit.

Environmental Effects

Direct Effects

Effects from the proposed project are prevented or minimized by buffering all streams and riparian habitats with Riparian Reserves. Riparian Reserves were considered to be adequate in maintaining viable populations of torrent salamanders during the Northwest Forest Plan species analysis (USDA/USDI 1994, Appendix J). In some areas, logging corridors would intersect these buffers and direct impacts to habitat or individuals is possible, but not likely as full suspension of logs over Riparian Reserves is prescribed. Prescribed burning would occur in Riparian Reserves in Alternative 4, but in the form of hand piles. Underburning is expected to burn at low-intensity resulting in a mosaic of burned and unburned areas. It is unlikely that fire would carry into the riparian areas and stream banks because fuels to carry fire are mostly absent within these areas as a result of the 2002 fire. No harvest related fuels (slash) would be created within the Riparian Reserves under Alternatives 2, 3, 5 and 6. In addition, a recent underburn in the Rumble Timber Sale (outside of the planning area) was allowed to back into the riparian area and southern torrent salamanders were easily found (unharmd) after the burning was completed (personal observations). The action alternatives are expected to have minimal impacts to this species.

Indirect Effects

Indirect effects may occur from increased sedimentation caused by harvest activities or through reduction of canopy closure, resulting in increased stream temperatures. This species rarely occurs in streams with maximum temperatures that exceed 61°F (Pilliod et al. 2003). These temperature increases are expected to occur as a result of the fire, regardless of salvage. Riparian buffers, including the partial harvest in the outer portion

of Class I and II Riparian Reserves in Alternative 4 would maintain existing stream shading to perennial headwaters within the planning area; therefore, no indirect effects would occur.

Cumulative Effects

The wildfires of 2002 impacted one of sixteen known sites for this salamander on the Forest. One of these sites was the North Umpqua River trail site, which burned at low-moderate intensities. In comparison to the impacts from the wildfires, the impacts caused by action alternatives are insignificant. The current trend of habitat loss and management impacts has lessened across much of this salamander's range due to a recent reduction in clearcutting, and increased awareness and protection of headwater habitats through riparian buffers (USDI 2000). High intensity wildfires may pose the most significant threat to this species. Because of this, Alternatives 1 and 5 have the greatest potential to cumulatively affect this species.

Impacts Determination

The no action alternative would not impact this species in the short term, but maintains a higher risk of high intensity fire in riparian habitat in the future than the action alternatives. All action alternatives may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or the species.

Pacific Fisher (*Martes pennanti*)

Affected Environment

A medium-sized member of the weasel family, the fisher is associated with low to mid-elevation (<4,000 ft.) late-successional/old growth forests in western Oregon (Aubry and Raley 2002), but is known to use closed-canopy forests of varying ages (USDA/USDI 1994 - Appendix J2-52). It is thought to avoid large (>3 acres) open areas. Fishers are closely associated with forested riparian areas, which they use for foraging, resting and as travel corridors (Heinemeyer and Janes 1994). Optimal conditions are defined as large patches of late-successional forest (≥245 acres) interconnected with other large forested patches.

According to Aubry and Lewis (2003) prior to extensive European settlement, the fisher occupied most coniferous forest habitats in Washington, Oregon and California. Since that time human activities (e.g., logging, trapping and poisoning) have resulted in the apparent extirpation of fishers throughout much of their historical range in the Pacific states. Currently, this species appears to be on the brink of extinction in the Cascade Range (USDA/USDI 1994) and populations are considered extremely low in Oregon (USDA 1994).

Current populations of fishers in Oregon are restricted to two separate and genetically isolated populations in the southwestern portion of the state. One population occurs in the southern Cascade Range and the other in the northern Siskiyou Mountains. The population in the southern Cascade Range was reintroduced between 1961 - 1981 and is descended from fishers from British Columbia and Minnesota (Aubrey and Lewis, 2003). Fishers were reintroduced to help control porcupine damage to young tree plantations (fishers prey on porcupine).

Aubry and Lewis (2003) document that loss of fisher populations from central and northern Oregon and Washington have resulted in the isolation of Oregon populations by >400 miles from those occurring in southern British Columbia. The authors conclude that the historical continuity in fisher distribution that once provided for genetic interchange among fisher populations in the Pacific states no longer exists. A July 3, 2003 finding documents that the west coast population of fisher may be a distinct population segment for which listing under the ESA may be warranted. A status review to determine if listing is warranted is currently underway (Federal Register 68:132 pg. 41169)

A small fisher population, studied by Aubry and Raley (2002), between the Rogue-Umpqua Divide and Crater Lake National Park has had individuals disperse as far as 30 miles (Pers. comm. T.J. Catton). Fishers were recently documented on the Diamond Lake Ranger District of the Umpqua National Forest (Farrell et al. 1996) at an elevation of 4,300 feet.

Current habitat conditions within the planning area are considered poor due to a lack of large patches of late-successional forests below 4,000 feet, as that habitat was consumed by the 2002 Apple Fire. The nearest potentially suitable habitat is located to the east and adjacent to the planning area (Calf Creek) within a Late-Successional Reserve (LSR-222) and roadless area.

Environmental Effects

Direct Effects

Direct effects would be from salvaging large dead trees within the burned late-successional habitats. This removes or degrades potential denning habitat and the effects are similar to those discussed for the northern spotted owl. However, because the fisher is more closely associated with interior forest habitat that occurs in large forested blocks, this effect is expected to be insignificant and perhaps discountable because no salvage occurs, under any action alternative, within interior late-successional habitat (>100 meters from an early-successional edge or opening).

Indirect Effects

Indirect effects could occur due to the salvage's effects on prey habitat, or large, dead wood. These impacts are similar to those discussed under the northern spotted owl. Riparian and other harvest buffers would maintain a significant amount of large dead wood throughout the planning area, which would provide for well distributed prey species habitat.

Cumulative Effects

The largest impact to this species came from the 2002 wildfires, especially within the Calf Creek and Boulder Creek drainages, which contain some of the largest remaining blocks of potential fisher habitat in this area. Because of the rarity of this species and the high unlikelihood that it occurs within the planning area (especially in the recently burned portions where the salvage is focused) the action alternatives add insignificantly to the cumulative impacts for this species.

Impacts Determination

The "no action" alternative would not impact this species in the short term, but maintains a higher risk of high intensity fire, with loss or set-back of future habitat (than the action alternatives). All action alternatives may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or the species.

Pacific Fringed Bat (*Myotis thysanoides vespertinus*)

Affected Environment

This bat is usually described as a cave-dwelling bat (Verts and Carraway 1998, Cristy and West 1993). However, fringed myotis are known to roost in rock crevices, bridges, buildings, large trees and snags (Cross et al. 1996, Weller and Zabel 2001). They mate from September to February and females form maternity colonies of up to several hundred individuals, which are usually in caves, but may occur in large hollow trees (Pat Ormsbee, pers. com.). Females produce only one young, usually born between late June and early July (Verts and Carraway 1998). A lactating female was captured during a study in a nearby drainage (about 10 miles to the west of the planning area) on June 29, 1995 (Cross et al. 1995).

Weller and Zabel (2001) documented that habitat use by this species is influenced by the availability of large (>12 inch d.b.h.), tall snags for roosting. Preliminary data from a recent study in the central western Oregon Cascades (Arnett and Hayes 2002) suggests a similar response by *Myotis* spp. and also a numerical response related to snag and roost tree availability. Roosts tended to be near stream channels (Weller and Zabel 2001), which are used for travel and foraging corridors, and also occurred in portions of stands that had lower canopy closures (probably easier roost access and sun exposure / micro-climate relationships). Fringed myotis often utilized snags in semi-open areas and forest edges (Cross et al. 1996) and seemed to prefer snags over green trees for roosting.

This species of bat uses multiple trees or snags as roost sites (Weller and Zabel 2001) and have been documented to use up to five different sites during an 18 day period (Cross et al. 1996). Roost switching is thought to be a normal behavior related to the ephemeral nature of some roost structures (e.g., snags fall down), changes in climate, avoidance of parasitic insects or predators or response to other disturbances.

Fringed myotis commonly feed on insects along forest edges and stream corridors. It is an aerial forager, but is known to glean insects from foliage or the ground. Moths make up a large portion of their diet (Verts and Carraway 1998).

There is a strong concern that loss of snags and large decadent trees from the widespread conversion of old-growth forests to young, even-aged plantations in this region has significantly reduced the availability of potential roosts for this and other bats (USDA/USDI 1994 - Appendix J2-49). There are ten documented occurrences of Pacific fringed myotis on or near the Umpqua National Forest and it is likely that they do occur within the planning area. The creation of thousands of large snags in open canopy areas (by the 2002 wildfires) may have increased the roosting habitat suitability in the planning area.

Environmental Effects

Direct Effects

Timber harvesting is expected to directly impact roosting habitat through the felling of large dead trees and snags. This impact would be lessened by the retention of decayed snags (when safe), leave trees for snag habitat and through Riparian Reserve (and other) no-harvest buffers. Maintaining riparian corridors of dead trees would likely provide good roosting habitat for this species now and over the next few decades. In addition, this project proposes salvage on less than 50% of the stand-replaced late-successional stands that were created by the fire, resulting in the maintenance of large dead trees, well distributed across the planning area.

Field reconnaissance located one large rock outcrop, at the top of Unit 71, with at least one small cave and some deep fissures that may be suitable for bats. The cave is difficult to get to and inaccessible unless ropes are used. Both cave and fissures have southerly exposures, and surrounding trees (dead and alive) are providing some shading and cover. In accordance with Forest Plan Standard and Guidelines (USDA/USDI 2001), bat presence is assumed until surveys can provide conclusive evidence that bats are not using the cave. Harvesting trees around this rock outcrop may cause disturbance to roosting bats (assuming occupancy) or perhaps alter the cave/fissure temperatures by exposing them to more direct sunlight. A 250 foot no-harvest buffer would be applied around this site if alternative 2, 4 or 6 are implemented. Alternatives 3 and 5 do not propose harvesting this unit. Harvesting operations would also cause disturbance to roosting bats within and adjacent to harvest units.

Indirect Effects

Indirect effects would likely occur as a result of changes in insect populations resulting from post-harvest and prescribed burning (fuels reduction) related vegetation changes (see discussion on impacts to early-successional habitat). These effects are not expected to be adverse and in some cases, may be beneficial.

Cumulative Effects

The effects of the wildfires in 2002 had greater impact on this species than the effects of the salvage (see impacts to late-successional habitat discussion). Approximately 20% of the potential roosting habitat created by recent wildfires on the Umpqua National Forest are proposed for salvaging in the foreseeable future. The remaining unsalvaged patches of dead trees (14,163 acres) are well distributed across and intermingled within the forested landscape. Overall, current and future levels of roosting habitat (as dead trees and snags) are now higher than they have been in previous decades, and would remain within a natural range after harvesting in all action alternatives. Disturbance impacts are short-term in duration. Therefore cumulative impacts from this and other projects are not expected to be significant for this species.

Impacts Determination

Following consideration of the direct, indirect and cumulative impacts of the proposed action, it is determined that the action alternatives “may impact individuals or habitat but is not likely to contribute to a trend toward federal listing or loss of viability of the species” because it retains levels of dead tree roost habitat within the natural range of variability for the planning area. The no action alternative would not impact this species in the short term, but maintains a higher risk of high intensity fire and loss or alteration of future habitat (than the action alternatives).

Pacific Shrew (*Sorex pacificus cascadenis*)

Affected Environment

One of the largest shrews in the area, the Pacific shrew was formerly considered a subspecies of the vagrant shrew. It is endemic to Oregon and occurs in two segregated populations. One is located on the Coast Range and the other in the southern Oregon western Cascades. The Pacific shrew is found in humid forests, marshes, and thickets and is considered a riparian species (Gomez and Anthony 1998) but has been found as far as 20 meters away from stream banks (Anthony et al. 1987). It is more commonly found in

early-successional forests and less often in late-successional stands. It requires down logs, brushy thickets, or ground debris for cover and feeding.

The nearest documented occurrence of this species is approximately 2 miles to the west of the planning area. This species is believed to be well-distributed throughout the forest. The Apple Fire likely impacted this animal where the fire burned with high intensity in riparian areas. However, it is possible that individuals survived in areas and may still occur within the proposed salvage area. Because surveys result in a high rate of mortality to this species (traps often kill the shrews), no surveys are planned. It is assumed that this species occurs within the planning area. Field reconnaissance shows insect prey species are in abundance in the area and riparian vegetation is recovering in most areas.

Environmental Effects

Direct Effects

Application of Riparian Reserve buffers would prevent or minimize timber harvesting effects to the shrew. The main impact to the shrew would likely come from the application of prescribed fire for post-salvage hazardous fuels reduction. The slash burning is expected to burn the ground unevenly, especially in moist riparian habitats, leaving unburned areas, which become available for animal survival (Bendell 1974). In addition, many small mammals often survive fire by moving into underground burrows or by moving to unburned areas (Forde 1983). There is a lack of ground fuel to carry the fire within Riparian Reserves and extensive burning is not anticipated within these buffers. However, it is still possible that the prescribed fire may kill or harm individual shrews.

Slash burning may result in a temporary loss of cover and food for the shrew and increase its exposure to predation. However, the shrew's ability to proliferate would help it to recolonize burned areas from areas that did not burn. A comparison of riparian acres, which may have some portions burned within them, is used to display the effects (Figure 52).

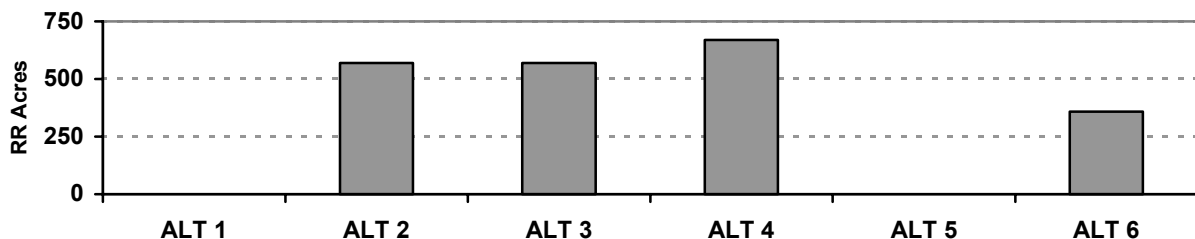


Figure 52. Comparison of direct effects from burning in riparian habitats to reduce fuels. Standard Riparian Reserve buffers of 180 feet for class 3-4 and 360 feet for class 1-2 streams were used. Not all acres shown are expected to burn due to a lack of fuels to carry the prescribed fire.

Alternatives 1 and 5 have no impact on potential shrew habitat, as no riparian burning would occur. Alternative 4 has the greatest impact because hand pile burning would occur within the buffers and potentially over the most acres. Alternatives 2 and 3 underburn about 100 acres less than Alternative 4, but this difference is insignificant. Alternative 6 has the least impact because it burns the least amount of acres.

Indirect Effects

Reforestation within riparian areas may have an indirect impact on this species and its prey base. Planting of conifer may impact the length of time that shrubby species dominate an area. However, riparian habitats are known to be very dynamic and usually have a good deciduous/shrub component along the margins of the stream channel. Alternatives 2, 3, 4, and 6 would use KV funds to plant riparian areas that experienced high intensity burning during the Apple Fire. This indirect impact would be negative because it would shorten the time that shrubby vegetation dominates the riparian area; however, in context of the naturally dynamic nature of the stream banks, this impact would likely be insignificant.

Cumulative Effects

Currently, there are approximately 1,919 acres of early-successional riparian habitat within the planning area. Considering the past, present and foreseeable future actions, which include the direct and indirect effects described above, up to about 75% of this habitat would either be burned to reduce fuels, planted with conifers, or both, potentially leading to short-term localized declines in shrew populations. However, these populations would eventually be reestablished by the survivors and through emigration from nearby unimpacted sites. Figure 52 can be used to compare the relative level of cumulative impacts between alternatives.

Impacts Determination

Following consideration of the direct, indirect and cumulative impacts of the proposed action, it is determined that the action alternatives “may impact individuals or habitat but are not likely to contribute to a trend toward federal listing or loss of viability of the species”. The no action alternative would not impact this species in the short term, but maintains a higher risk of high intensity fire and future impacts to habitat.

BIG GAME

Affected Environment

Roosevelt elk and black-tailed deer are the most common big game within the planning area. Black bear and mountain lion also occur within it. The planning area is located within the Oregon Department of Fish and Wildlife’s Dixon Wildlife Management Unit (WMU) and accounts for 1.4% of its total area. The largest elk herds within this WMU occur 8-15 miles to the east and 15 miles to the south of the planning area (ODFW telemetry data), although smaller herds are not uncommon within the Panther Creek drainage and Panther ridge area. The planning area contains good Roosevelt elk habitat especially along its west and northwestern portions. However, the fire mainly burned in the eastern steep/dry portions of the planning area where deer are more abundant within and adjacent to salvage units than elk.

The northwestern portion of the planning area is identified as a winter range management area under the Umpqua LRMP (USDA 1990). Limpy Creek is also identified, but mainly acts as a corridor for movement between the Calf Creek and Panther Creek drainages. The Forest Plan identifies these areas for providing big game winter range and timber production (USDA 1990, IV-132-133). At least 20% of these areas must be in optimal cover

conditions (late-successional forests). The current level is about 40% for the planning area. Timber salvage is permitted. Clearcut harvesting is the preferred technique and unit sizes should average 20 acres and maximize edge with areas of cover (USDA 1990, IV-195). The average unit size (includes openings created by adjacent units) is approximately 11.5 acres under all action alternatives. Riparian buffers would maximize edge of dead tree habitat, which provides some cover.

Environmental Effects

Direct and Indirect Effects

Hauling and timber harvesting activities along roads may have direct effects to big game due to human disturbance (Toweill and Thomas 2002). However, this effect is temporary and animals return at night or times when activities are not occurring. Permanent abandonment is not common. Of the action alternatives, Alternative 6 requires the least amount of road use and has the lowest amount of potential disturbance to big game. Prescribed burning in the spring may have direct impacts to big game because of the limited mobility of the young to avoid these areas of human activity (Lyon et al. 2000). Alternatives that have more hand-pile burning in the fall (Alternatives 5 and 6) would have less impact than those that prescribe broadcast burning in the spring.

The fire reduced hiding cover, which in conjunction with high road densities can impact use of foraging habitat. Deer and elk increases are well documented after fires if adequate cover is available (Fire Effects Information Systems (FEIS) database 2003). In general, fires that create mosaics of forage and cover are beneficial. Effective cover in the burned area was greatly reduced by the fire. In addition, standing dead trees may provide adequate cover within burns (FEIS 2003). Salvage would result in indirect impacts to big game from harvesting these dead trees and reducing their density, thus impacting their effectiveness as hiding cover. This impact is more severe in areas with high road densities and heavier salvage prescriptions. Riparian buffers would provide adequate areas for hiding, and are commonly used for travel, foraging and resting areas by big game.

All of the action alternatives would have direct impacts on big game through harvest related disturbances and alteration of hiding cover. Disturbance impacts are temporal and big game would likely return once harvest operations are completed. Impacts to hiding cover would cause shifts in habitat use, but enough cover remains well distributed throughout the planning area, especially in draw bottoms, that this impact is not considered significant.

Cumulative Effects

The decline in forage habitat resulting from reductions in clearcut timber harvests, increases in road densities and current forest management emphasis on thinning forests has caused increased harassment and displacement of elk to private properties in some areas (ODFW 2003). However, the current road system¹⁹ with a road density of 4 miles of road per square mile of land in the Panther Creek watershed is probably the single largest factor affecting habitat effectiveness for big game in the planning area. Closures of roads (e.g., decommissioning) is known to increase the survival and productivity of Roosevelt elk populations (Cole et al. 1997). All alternatives maintain the current road network. During

¹⁹ Roads affect big game in three basic ways. First, they physically remove land area from the habitat base. Secondly, they increase vulnerability to hunting and poaching. And finally, they decrease habitat utilization due to human disturbances (e.g., big game avoid foraging in areas with high hunting pressure).

the road analysis, about 3 miles of existing roads within winter range received a recommendation for decommissioning.

The main cumulative effect to big game has been caused by the wildfire. Fire can provide or improve forage resources for deer and elk within 1 or 2 years after burning. Presence of serviceberry in the understory is an important consideration because of its palatability and ability to resprout strongly from root crowns after fire (FEIS 2003). Deer seem to prefer foraging in burned compared to unburned areas, although preference may vary seasonally. Following fire most preferred elk forage species are enhanced by an increase in available nutrients. Fires increase forbs, grasses, and shrubs, create edge habitat and snags for cover. Because forage habitat is becoming limited (ODFW 2003), the fire has a cumulative beneficial effect because it would provide good forage in the next few years.

Fire creates early-successional habitat where grasses, forbs and fruit-producing shrubs are more abundant and beneficial to black bear. Huckleberries are more productive on recently burned sites compared to unburned sites. Fire can also provide a medium for insect invasions, which also provides food. Another big game species, the mountain lion, may change its home range in response to wildfire, but generally their habitat is enhanced or expanded by fires that improve habitat for prey species. An increase in mountain lion numbers was documented after a fire increased the local deer population in a forest in British Columbia (FEIS 2003).

When compared to the impacts of roads (adverse) and wildfire (beneficial), the action alternatives add insignificantly to the cumulative effects on big game.

SPECIES PREVIOUSLY KNOWN AS SURVEY & MANAGE, PROTECTION & BUFFER SPECIES, NOW CONSIDERED SENSITIVE SPECIES

When the DEIS was released, the Forest Plan required protection of certain late-successional wildlife species, which may not have been fully protected by other standards and guidelines, when they occur outside of LSR's or Riparian Reserves. Additional amendments to the Northwest Forest Plan redefined Survey and Manage categories based on new information and species characteristics (USDA/USDI 2001). On April 21, 2004, the Northwest Forest Plan (NWFP) will again be amended to remove Survey and Manage mitigations.

As part of the analysis conducted to amend the NWFP, all 296 Survey and Manage species were reviewed by Special Status Species Program Managers to determine if they warranted inclusion in Agency Special Status Species Programs. Based on that review, 152 of the 296 Survey and Manage species were eligible for inclusion in one or more of the Agencies' existing Special Status Species Programs. For Survey and Manage wildlife that occur on the Umpqua National Forest, and are addressed in the Biological Evaluation for the Baked Apple Fire Salvage (dated - October 1, 2003) this entails the following changes:

Red Tree Vole → Was a Category D species, List 4 under ONHP → Does not meet criteria for Sensitive species on the North Umpqua Ranger District. Prior to the S&M ROD, this species was removed from Survey and Manage status in the mesic portion of its range (in which the planning area occurs) on 12/19/03, based on the 2003 annual species review. This species meets criteria for Sensitive Species in the northwest corner of Oregon's Coast Range.

Great Gray Owl → Was a Category A species, List 4 under ONHP → Does not meet criteria for Sensitive species. This species meets criteria for Sensitive species in California and Washington, but not in Oregon.

Crater Lake Tightcoil → Was a Category A species, List 1 under ONHP → Meets criteria for Sensitive species.

There are two species known to occur within the planning area; the red tree vole and the great gray owl. The Crater Lake tightcoil is unlikely to occur within the planning area. These species are now discussed in the context of Sensitive species; they are kept separate from the discussion of the other Sensitive species for tracking purposes between Draft and Final.

Red Tree Vole (*Arborimus longicaudus*)

Affected Environment

The Oregon red tree vole is endemic to moist coniferous forests of western Oregon and northwest California (USDA/USDI 2000). It inhabits conifer forests containing Douglas-fir, grand fir, Sitka spruce, western hemlock, and white fir (USDA/USDI 2000). Optimal habitat is old-growth Douglas-fir forest (Carey 1991). Aubry et al. (1991) found that red tree voles occur in old-growth forests significantly more than in younger forests, and also suggested that the parameters associated with age (such as large, live, old-growth trees) are important habitat components.

Environmental Effects

Direct, Indirect and Cumulative Effects

Unit 79B would not be harvested in any alternative in order to protect the known red tree vole site. Therefore, no direct effects to the known nest trees would occur. Direct effects may occur to suitable habitat in units 78B and 79A during harvest operations if green trees are felled for logging corridors or safety. Some of the proposed salvage units that have partial harvest prescriptions are within suitable red tree vole habitat, even though these stands were burned during the fire. No red tree vole sign (nests or resin ducts) were found during general field reconnaissance. Most of these stands experienced significant heating to the canopy during the fire, but it is possible that this species survived and may still occur within these stands. Surveys were not conducted because they were not required. Alternative 6 was designed to avoid impacts to potential habitat by eliminating salvage in partial harvest stands and would have no direct, indirect or cumulative effects to red tree vole habitat. All other action alternatives may have direct and indirect effects to red tree vole habitat when green trees are incidentally felled during harvest operations. However, this affect is expected to be very limited in scope and scale.

Great Gray Owl (*Strix nebulosa*)

Affected Environment

This owl is one of the largest owls in North America. Oregon and Northern California populations are considered to be on the southern edge of its range. It nests in late-successional forests (>60% canopy closure), but forages in early-successional habitat (e.g., meadows, clearcuts). Within the range of the northern spotted owl, it is most common in lodgepole pine forests adjacent to meadows, but is also found in other coniferous forest

types. The primary limiting factor affecting this bird in the western Cascades seems to be foraging habitat (Huff et al. 1997). In some locations, such as on the Willamette National Forest west of the crest of the Cascade Range, at least some shelterwood harvesting seems to be beneficial for the species by opening up otherwise closed canopy cover for foraging.

There are no known nest sites for this bird within or adjacent to the planning area. This owl does occur directly adjacent to the planning area and probably forages within it. Four historical records of this owl occur along the ridges surrounding the planning area. The nearest sizeable natural meadow is Limpy Prairie, which is located in the extreme southern end of the planning area and about one mile from the nearest proposed salvage unit. Therefore, no surveys²⁰ were conducted for this species; surveys are no longer required for this species.

Environmental Effects

Direct, Indirect and Cumulative Effects

Forests with sufficient amounts of down logs and meadows tend to have larger populations of small mammals, which serve as prey for the great gray owl (USDA/USDI 1995). Forestry practices such as salvage of down logs can be expected to have an adverse impact on the species (USDA/USDI 1995). The Apple Fire created an abundance of foraging habitat for the great gray owl. This habitat is temporary, as forest succession takes place. All action alternatives would have indirect impacts to this species through changes in prey species habitat. To mitigate this impact, each alternative leaves various amounts of dead wood within the planning area to mimic the natural range of variation that prey species populations are accustomed to. Mitigations include no-salvage buffers and retention trees within units. Some modification of late-successional structure would occur as discussed earlier. This may have direct impacts on nesting habitat for this species, because they are known to nest along edges of man-made openings (e.g., clearcuts). These man-made openings do not require surveys, and surveys are no longer required. Overall, the impacts to great gray owls from implementation of the action alternatives are expected to be minor.

Crater Lake Tightcoil Snail (*Pristiloma arcticum crateris*)

Affected Environment

This tiny snail is found above 2,000 feet elevation in moist conifer forests and among mosses and other vegetation near wetlands, springs, seeps, and riparian areas. It may be found on logs, among sedges, attached to decaying leaf surfaces, in litter, or inside other shells (USDI 1999). It requires perennially wet situations in mature conifer forests and only occurs within 33 feet of open water, generally in areas which remain under snow for long periods in the winter.

The nearest known sites for this species are 18 miles to the southeast at elevations above 4,900 feet. On this forest, they occur within the true fir vegetation zones (white and silver fir). The proposed salvage occurs primarily in a steep/dry area, below these forest types, within a highly dissected terrain that has experienced moderate to high intensity,

²⁰ The triggers for surveys were ground disturbing activities above 1,700 ft. elevations within mature stands (80 years plus) with greater than 60% canopy cover and within 1000 ft. of a natural meadow larger than 10 acres.

stand replacement fire. Mollusk surveys conducted in the planning area in the late 1990s failed to find this species. Pre-project clearance was complete for this species (during project analysis in 2003) through reference to the latest scientific literature, evaluation of species-habitat associations, field reconnaissance, presence of suitable or potential habitat in relationship to proposed salvage and ground disturbing activities. In addition, existing local survey records and data from the Interagency Survey and Manage Species database (ISMS) were reviewed and a species expert (Nancy Duncan) was consulted with. The proposed salvage met management requirements for these species before removal from Survey and Manage and it meets the requirements under the sensitive species program. The movement of this species to the Sensitive species list does not change the determination that habitat for this species remains poor to non-existent; no additional surveys are required.

Environmental Effects

Direct, Indirect and Cumulative Effects

The probability of this species being present in the project area is very unlikely based on the current condition of the burned forest (no longer late-successional habitat) and the steep and dry nature of the terrain. The probability that this project would cause a significant negative effect on the species or its persistence in the area is very small. Riparian buffers along all streams and perennial waters under Alternatives 2, 3, 5, and 6 makes it even more unlikely that this project might impact this species. The minimal impact caused by the 32 acres of riparian removal and the proposed slash treatment in Alternative 4 would not affect this species. Because of this information, it was determined that there was no need for surveys for this species. Overall, no direct, indirect, or cumulative effects (and therefore, No Impact) from any alternative are expected to occur to this species or its habitat.

LANDBIRDS - TRACKED AS A SIGNIFICANT ISSUE

Affected Environment and Environmental Effects

The degree of fire-caused mortality of birds can depend on the season of burn (Smith 2000). Mortality to adult landbirds is usually minor due to their ability to move from the fire, however mortality to nestlings and young does occur. Burning that occurs during the spring coincides with the nesting and fledging season for many landbirds, and therefore has more direct effects than burning that occurs in the fall, when birds are fully mobile and able to escape the flames and smoke. The spatial extent of the burning also relates to the magnitude of the effect. Broadcast burning has a higher likelihood of impacting birds than handpile burning.

It was determined during scoping that the heat, smoke and gasses from burning slash in the spring may impact migratory birds. The measure selected to assess the impacts of the alternatives is the number of acres burned during spring. This measure was selected because it helps predict impacts to birds migrating through the area.

Continental and local declines in numerous bird populations have led to concerns for the future of migratory and resident landbirds. In the Cascades Mountains, 20 landbird species have demonstrated significant recent and/or long-term population declines (Sauer 2003). As a result, the USFS developed a Landbird Strategic Plan (USDA 2000). In

addition, a Presidential Executive Order and a Memorandum of Understanding (MOU) for the conservation of migratory birds were signed in 2001.

The direct impacts from the proposed project entail prescribed fire to reduce logging created slash within harvest units. Alternative 1 has no impact. Alternative 5 involves only handpile burning during the fall season, and therefore poses little risk to exposing young birds to direct fire effects. Alternatives 3, 6 and 2 vary in degree of risk, from less to more, respectively, based on differences in acreage planned for broadcast burning during spring and handpile burning during the fall.

Because this project proposes burning on recently burned ground, the indirect and cumulative effects common to fire on birds are negligible when compared to effects of the wildfire. The issue of prescribed burning and its effect on landbirds applies specifically to the direct effects of fire. The following discussions elaborate on various indirect and cumulative impacts associated with landbird species that this proposed salvage is most likely to impact.

The Landbird Strategic Plan sets forth goals and actions to assist the Forest Service in providing sustainable habitat for landbirds and is described in detail in the Wildlife Report. The landbird conservation plan for this area is the “Westside Coniferous Forest Landbird Conservation Plan” (Partners In Flight [PIF] 2000). This plan is not regulatory, but does provide recommendations for forest management at both the stand and landscape-scale. It recommends restoration and maintenance of forest conditions and habitat attributes necessary to sustain healthy bird populations over the long-term. The overall objective of the conservation plan is to reverse declining population trends and achieve stable or increasing trends within the next couple of decades throughout western Oregon and Washington.

The plan calls for a complex array of forest conditions from early to late-successional habitat within the landscape. The proposed Baked Apple Fire Salvage contains a blend of reserves (e.g., riparian and sensitive soils) and mitigation measures that are designed to balance natural resource extraction with maintenance of a healthy ecosystem. Salvage impacts will mainly be on early-successional habitats created by the stand replacing fire. Structural and compositional attributes that appear to be most important for landbirds in early-successional forests are residual canopy trees, snags, deciduous vegetation and nectar-producing (flowering) plants. As discussed earlier, some impact to late-successional habitat would occur. Vaux swift (*Chaetura vauxi*), is a focal species listed in the conservation plan that may be affected by salvaging in late-successional habitat. The direct, indirect and cumulative effects for this species are related to salvage that occurs in late-successional habitat. The discussion on late-successional habitat fully discloses how each alternative may impact late-successional habitat, and Vaux’s swift. The following discussions disclose the direct, indirect and cumulative impacts expected to occur from the salvage on the four focal landbird species, which occur within the early-successional habitats impacted by the proposed salvage.

Of the 20 landbirds listed in the conservation plan, four occur within the early-successional habitat impacted by the proposed project (Table 30) and are described below. Table 30 documents changes in relative abundance for the four landbird species that occur in the Baked Apple Planning Area.

Table 30. Provincial and local population trends, in terms of relative abundance, for landbird focal species potentially impacted by the proposed project. Local data is from the nearby Fish Lake Breeding Bird Survey (BBS) route.

Habitat Attribute	Focal Species	Cascades Trend			Local Trend
		1966-2002	1980-2002	1993-2002	1993-2002
Residual Trees/Snags	Olive-Sided Flycatcher	-3.36	-3.57	-2.99	-1.98*
Snags	Western Bluebird	-8.97	-10.75	-9.42*	Not Recorded on Local Route
Deciduous Vegetation	Orange-Crowned Warbler	-6.75*	-0.52*	-11.05	+12.76*
Flowering Plants	Rufous Hummingbird	-2.03	-3.33	+4.41*	-21.26*

*Not statistically significant ($p > 0.1$)

Olive-Sided Flycatcher (*Contopus cooperi*)

Affected Environment

This bird is a long-distance, neotropical migratory bird²¹ that uses forest openings and edges. It is highly associated with combinations of late and early-successional habitat edges and more abundant in fragmented landscapes than unfragmented landscapes (McGarigal and McComb 1995, Hagar et al. 1995). Its presence in early-successional habitat appears to be dependent on the availability of snags or residual live trees for singing and foraging perches (Altman and Sallabanks 2000). The most important variable for nesting success in managed early-successional forests may be the presence of snags >40 feet tall (PIF 2000).

This species may be dependent upon stand-replacing forest fires, which create optimal habitat for it (Hutto 1995). Abundance is higher in burned areas than in adjacent unburned late-successional forests. The 2003 breeding bird surveys (BBS) detected a higher abundance of this species in relationship to pre-fire data (1993-2002) from the adjacent Fish Lake BBS route. This species was only detected at stations with a mix of green and stand-replaced late-successional forest. Stand exam data from proposed salvage units indicate that upland dead tree canopy closures currently range from 17%-58%. This data suggests that the proposed salvage units are currently suitable habitat for the olive-sided flycatcher.

Environmental Effects

Direct Effects

Current scientific information for the olive-sided flycatcher suggests the need to avoid or minimize salvaging after stand-replacing fires (Altman and Sallabanks 2000). Altman (2000) recommends maintaining some portion (e.g., >2%) of the landscape as post-fire habitat. However, this species has been shown to respond positively to clearcut

²¹ Neotropical birds are those that migrate to the tropical portions of the Americas.

harvesting (Altman and Sallabanks 2000) as long as some singing and perching structures are retained. For this project, post-harvest canopy closures are predicted to range from 1%-3% for units that retain 4 trees per acre, to 10%-31% in units that leave 50% of the existing tree density. Since there is no data indicating minimum densities of trees or snags per acre needed by this species, all post-harvest units could be suitable habitat after salvage logging. Perhaps the best comparison of direct effects is the percentage of the current post-fire habitat within the planning area that remains unsalvaged. This is shown in Figure 48, under the effects to “landscape distribution of dead wood” section. Alternative 1 (no action) has no direct impact on this bird. It maintains the highest amount of post-fire habitat, followed by Alternatives 5, 3, 6, 2 and 4. Alternative 6 minimizes impacts to optimal habitat by avoiding salvaging of dead tree patches intermixed with late-successional forest and concentrating the salvage within the burned steep/dry landscape area. The impacts from the action alternatives are expected to have no significant adverse affect on this bird.

Indirect Effects

Retention of trees within harvest units that have suitable habitat for corvids (crows and ravens) and squirrels may create “ecological traps” to this species (Altman and Sallabanks 2000). This might happen when harvest units occur within or adjacent to unburned forests that contain these predators, which prey on the eggs and nestlings of this bird. There are probably lower densities and poor habitat for these predators in burned forests following moderate to high intensity fires; therefore, there are less impacts to the flycatcher. The proposed project focuses on salvaging within the most severely burned areas of the planning area and the impact is not expected to be significant.

Cumulative Effects

Cumulative impacts of the proposed project are analyzed at a broader scale (the forest scale), using the recommendations from Altman and Sallabanks (2000). Because this bird is a long-distance migrant, the current and future condition of unsalvaged, stand-replacement fire patches is important. Cumulatively, about 1.8% of the federally managed land on the Umpqua National Forest is post-fire, early-successional forest with high densities of dead trees. The action alternatives do not decrease this amount to less than 1.6%, including the proposed Tiller Fire Salvages and potential salvaging in the LSR on the Tiller Ranger District.

The BBS post-fire data suggests a local increase in abundance for this species. This trend is expected to continue under all alternatives. As forest succession takes place, and snags begin to fall, populations would stabilize and eventually decrease once these burned stands develop back into older forests and this species moves to other areas on the forest that may become suitable habitat through future disturbances.

Western Bluebird (*Sialia mexicana*)

Affected Environment

The western bluebird is strongly associated with early-successional forest conditions in the grass/forb stage (McGarigal 1993) and known to nest in dense patches of fire-killed snags (Zarnowitz and Manuwal 1985). It responds positively to increases in snag density of both hard and soft snags. Nesting usually occurs in young (<5 years) clearcuts and productivity declines with increasing clearcut age (McCullough 1991). Hairy woodpeckers play an important role in creating nesting habitat for western bluebirds.

Western bluebirds were detected at five BBS stations within the planning area. Eighty-percent of these detections were in stand replaced late-successional patches below 3,500 feet in elevation. Field reconnaissance detected five separate pairs within proposed salvage units. In comparison, no western bluebirds have been detected over the previous 10 years before the fire (1993-2002) in the adjacent Fish Lake BBS route (OR-244).

Environmental Effects

Direct, Indirect and Cumulative Effects

The proposed project effects on this species are similar to those for the olive-sided flycatcher. The first year of BBS data suggests an increase in abundance for this species. This trend is expected to continue under all alternatives.

Orange-Crowned Warbler (*Vermivora celata*)

Affected Environment

A long-distance, neotropical migratory bird that breeds in the coniferous forests of western Oregon and Washington, the orange-crowned warbler occurs primarily below 4,000 feet elevation, predominantly in coastal forests. A foliage-gleaning insectivore associated with dense deciduous trees and shrubs (PIF 2000), it reaches peak abundance once a shrub layer has developed (5-10 years) and before an overstory conifer canopy develops.

This bird was detected within the planning area at a higher abundance than it occurred over a ten year (pre-fire) period along the adjacent Fish Lake BBS route. Natural re-vegetation and re-sprouting of deciduous shrubs and trees is presently occurring throughout the burned portions of the planning area.

Environmental Effects

Direct Effects

The proposed action directly affects nesting and foraging habitat for this species. Salvaging of dead trees does not seem to negatively affect this species, based on the available data. However, ground disturbing logging impacts (e.g., skid trails, falling of trees) followed by broadcast burning have a direct impact to shrubby, deciduous ground vegetation. This impact may make harvest units unsuitable during these operations (1-2 year period), especially if they occur during the nesting season. A reasonable comparison of direct impacts can be based on the acreage of intensive land management, where at least 2 activities (logging and broadcast underburning) are proposed to occur on the same piece of ground (Figure 53).

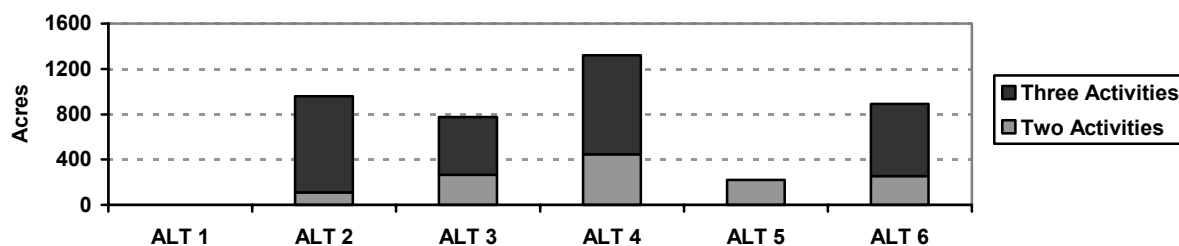


Figure 53. Comparison of direct impacts to the orange-crowned warbler based on acres with the highest level of management intensity (as indicated by the number of activities).

Alternative 1 has no direct impact. Alternative 5 has the least impact and does not propose broadcast burning of salvage units; instead it proposes hand piling and burning slash, which allows for fall burning (outside of breeding season) to avoid impacts to nesting birds and other wildlife. Alternative 4 has the greatest impact as it burns 887 acres in the spring, followed by Alternatives 2 (858 acres), 6 (631 acres) and 3 (519 acres) (in order of greatest to least impact). Overall, the direct effects of the salvage on this species would be short-term and populations would rebound, probably increasing 5-10 years after salvage operations are finished.

Indirect Effects

Reforestation can speed up the rate of succession and shorten the time that shrubs and forbs dominate an area. The indirect impacts of the proposed alternatives on the warbler are previously described under the “indirect effects to early-successional habitat” section of this document (Figure 38).

Cumulative Effects

The cumulative impacts of the proposed alternatives are related to those previously described under the “cumulative effects to early-successional habitat” section of this document (Figure 39). Initial indications are that the local population of orange-crowned warblers has increased due to a pulse of habitat created by the fire. This increase may be delayed for 1-2 years during salvage operations, but would continue as forest succession continues. The local population would likely peak in 5-10 years, after completion of salvage operations, and then begin to decrease slowly as conifer trees begin to re-dominate the burned areas. Shrubby habitat would remain longer in areas not reforested, or in areas where conifer are planted at a wider spacing. Local populations would eventually leave for other suitable shrubby habitat areas on the forest.

Rufous Hummingbird (*Selasphorus rufus*)

Affected Environment

The rufous hummingbird is a long-distance, neotropical migrant bird that also breeds in this area. It is primarily associated with coniferous forest edges and openings with a

diversity of flowering plants for feeding and open spaces for aerial displays of courtship behavior.

This bird was detected within the planning area at a higher abundance than it occurred over a ten year (pre-fire) period along the adjacent Fish Lake BBS route. The Apple Fire created a pulse of habitat for this species. Post-fire re-vegetation of many nectar-producing plants is occurring within the first spring following the burn. A more stable, yet small, component of this habitat also comes from natural openings (e.g., meadows and rock outcrops), which take up approximately 1% of the planning area.

Environmental Effects

Direct Effects

The proposed action directly affects nesting and foraging habitat for this species. Salvaging of dead trees may have a beneficial affect (by opening up areas for courtship behavior) and does not seem to negatively affect this species based on the available data. However, ground disturbing logging impacts (e.g., skid trails, falling of trees) followed by broadcast burning have a direct impact to nesting birds and their nesting/foraging habitat. This impact may make harvest units unsuitable during these operations (1-2 year period), especially if they occur during the nesting season. The magnitude of direct impacts on the hummingbird is similar to those for the orange-crowned warbler, as shown in Figure 53.

Indirect Effects

Reforestation can speed up the rate of forest succession and shorten the time that nectar-producing shrubs and forbs dominate an area. The indirect impacts of the proposed alternatives on the hummingbird are previously described under the “indirect effects to early-successional habitat” section of this document (Figure 38).

Cumulative Effects

The cumulative impacts of the proposed alternatives on the hummingbird are related to those previously described under the “cumulative effects to early-successional habitat” section of this document (Figure 39). Other cumulative effects would be the same as those described for the orange-crowned warbler.

MANAGEMENT INDICATOR SPECIES

The Umpqua National Forest Land and Resource Management Plan (1990) identifies the following species/groups as management indicator species (MIS) for the Forest: northern spotted owl, pileated woodpecker, marten, bald eagle, peregrine falcon, Roosevelt elk, black-tailed deer, and cavity nesters. Environmental effects to late-successional habitat and coarse woody debris adequately disclosed effects to the pileated woodpecker, marten and cavity nesters (all of which are late-successional species dependent upon dead wood habitats). Effects to northern spotted owls, peregrine falcons and bald eagles were discussed under the sensitive species section. Effects to Roosevelt elk and black-tailed deer were discussed in the big game section.

SUMMARY

The most likely method for maintaining viable populations of wildlife within the planning area centers on restoring and maintaining (to the extent practical) landscape patterns,

forest stand structures and vegetative diversity to conditions similar to those under which native wildlife evolved. This management goal is consistent with the Aquatic Conservation Strategy (USDA/USDI 1994).

To achieve this goal while providing forest commodities, the proposed project design took shape with consideration for the recommendations of the Middle North Umpqua River watershed analysis (USDA 2001) and input from the interdisciplinary team resource specialists.

Certain actions can be taken to reduce potential impacts or effects to TES species and wildlife and allow maintenance of viable populations of existing native wildlife in the planning area. Mitigation measures for reducing impacts and maintaining viable wildlife populations are found in Chapter 2. Overall project effects are documented in Table 31 for Threatened, Endangered and Sensitive Wildlife Species.

Table 31. Determination of effects to Threatened, Endangered, and Sensitive and Wildlife Species. (* effective 4/21/04).

Review Process	Conclusion of Effects, based on pre-field review, field verification, and determination of effects.					
	Determination of effects by Alternative					
Birds	1	2	3	4	5	6
Northern Spotted Owl	LAA	LAA	LAA	LAA	LAA	LAA
Bald Eagle	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
Peregrine Falcon	MIH	MIH	MIH	MIH	MIH	MIH
Harlequin Duck	NI	NI	NI	NI	NI	NI
Bufflehead	NI	NI	NI	NI	NI	NI
Yellow Rail	NI	NI	NI	NI	NI	NI
Amphibians						
Oregon Spotted Frog	NI	NI	NI	NI	NI	NI
Foothill Yellow-legged Frog	NI	NI	NI	NI	NI	NI
Southern Torrent Salamander	MIH	MIH	MIH	MIH	MIH	MIH
Reptiles						
Western Pond Turtle	NI	NI	NI	NI	NI	NI
Common Kingsnake	NI	NI	NI	NI	NI	NI
Mammals						
Canada Lynx	NE	NE	NE	NE	NE	NE
California Wolverine	NI	NI	NI	NI	NI	NI
Pacific Fisher	MIH	MIH	MIH	MIH	MIH	MIH
Pacific Fringed Bat	MIH	MIH	MIH	MIH	MIH	MIH
Pacific Pallid Bat	NI	NI	NI	NI	NI	NI
Pacific Shrew	MIH	MIH	MIH	MIH	MIH	MIH
Mollusks						
Crator Lake Tightcoil Snail *	NI	NI	NI	NI	NI	NI

Key to determinations:

The threatened and endangered species determination calls follow the nomenclature established by the US Fish and Wildlife Service:

NE= No Effect, NLAA= Not Likely to Adversely Affect, LAA= Likely to Adversely Affect

For sensitive species, determinations follow the nomenclature established in the Forest Service Handbook:

NI= no Impact;

MIH= May Impact Individuals or Habitat but will not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species;

WIFV= Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.

* The Crater Lake tightcoil becomes a sensitive species on April 21, 2004.

SOILS IN THE PROJECT AREA

Affected Environment

Information on the soils within the planning area was gathered from the Land Resource Inventory²² and Soil Resource Inventory²³ for the Umpqua National Forest and verified through field reconnaissance of the units by soil scientists. These surveys included observations of fire effects, soil disturbance, slope stability, erosion hazards, effective ground cover, soil suitability and site severity. Within the analysis area there are eighteen soil land-types that are potentially affected by the proposed actions. Soils with a unique combination of physical, chemical and topographic characteristics are grouped into land-types. Typical surface horizon depths and Surface Erosion Potential are displayed in Table 32 (Umpqua NF, 1976. Soil Resource Inventory).

Table 32. Landtype Characteristics of Proposed Salvage Units.

Soil Land-Types	Representative Harvest Units	Surface Horizon Depth (inches)	Surface Erosion Potential
8	15, 18, 26B, 30, 46, 47, 25A-B, 27A-E, 28B, 48A, 48B	Variable	Moderate
41	42	6"	Moderate
42	44	8"	Moderate
46	38, 39, 40, 41A-B, 42, 43, 44, 49, 56A-B, 57, 58A, 58C, 59A, 62A-D, 75, 76, 77, 78A-F, 79A, 88A-B, 89, 90, 96	5"	Moderate
221	66, 68, 69, 72, 74A-B, 75, 76, 77	9"	Variable
244	2A	9"	Low to Moderate
245	27A, 28A-B, 30, 47, 91	9"	Low to Moderate
277	75	10"	Low to Moderate
321	9B-C, 45A-F	4"	Moderate to High
421	4, 9B-C, 45A	8"	Moderate
453	49, 58A, 59A-C	6"	Variable
461	68, 69, 70, 71, 72, 73, 74B, 86, 87, 94, 95, 96	5"	Moderate
467	80, 96	5"	Low to Moderate
468	44, 69, 74A, 78A-C, 78E-F, 79A, 88A-B	5"	Low to Moderate
478	78B	5"	Low

²² Unpublished Soil Survey of the Umpqua National Forest, Roseburg, OR.

²³ Radtke, Sherman and Rudolph V. Edwards, Jr. 1976. Soil resource inventory. R-6, Umpqua National Forest, Roseburg, OR.

Soil Land-Types	Representative Harvest Units	Surface Horizon Depth (inches)	Surface Erosion Potential
525	15, 16, 17, 18, 19, 25A-B, 37, 46, 48A-B, 71, 86, 87	8"	Low to Moderate
541	16, 17, 18, 25A-B, 26A-B, 27D, 35, 48B	6"	Low to Moderate
543	58A, 62B, and 62D	6"	Low to Moderate

Landtypes that encompass all salvage units proposed are listed here. Some units are listed twice because the unit boundary crosses a Landtype boundary. Each land-type is described in detail in the Soils Report, located in the Appendix.

As displayed in Table 32, the proposed salvage units represent a wide variety of Landtypes and erosion potentials. For example, landtypes 221 and 453 are combinations of two or more landtypes. In these complex landtypes, the erosion potential varies considerably depending on slope and soil characteristics. These landtypes do not have one defined erosion potential, and are considered "variable". Unit's 45A-F and 9B-C are located in landtype 321 which has a moderate to high surface erosion potential.

Detailed analysis of all proposed salvage units was conducted using the Watershed Erosion Prediction Project (WEPP) model (to predict surface erosion) and the SHALSTAB model (to predict susceptibility to shallow rapid landslides). This analysis is discussed in the aquatic section of this Chapter.

Erosion Hazard for the Baked Apple planning area is displayed in Figure 54. To make this map, each landtype was placed in an Erosion Hazard Class from low to high based on representative soil surface textures and slope steepness. Long term Erosion Hazard will not change based on the effects of the 2002 Apple Fire or the effects of this project. Short term erosion hazard was modeled and is described in the aquatics section of this chapter.

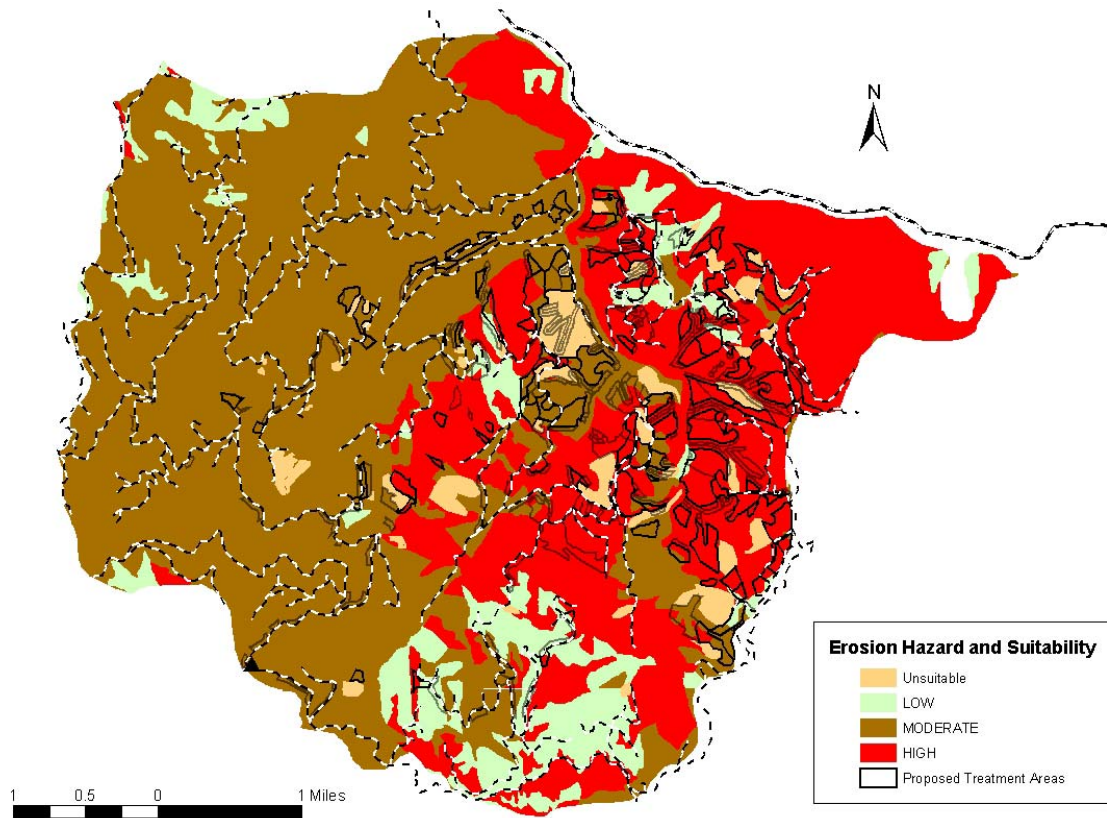


Figure 54. Erosion Hazard for the Planning Area.

Thirty-three percent of the planning area has a high erosion hazard and 66 percent of the planning area has moderate or low erosion hazard (Table 33). High erosion hazard predominates in areas proposed for harvest with a “high” erosion rating that varies from 47% of the proposed treatment area (Alternative 5) to 66% (Alternative 6). Regardless of erosion hazard, the burned areas would experience an increase in erosion rates due to the loss of vegetation and fine organic matter from the fire. Most of this erosion is related to the fire effects. The proposed activities contribute a relatively small amount of surface erosion that is proportional to the total acreage of proposed treatments.

Table 33. Erosion Hazard Distribution for the Planning Area and Action Alternatives.

Erosion Hazard Class	No Action		Alternatives									
			2		3		4		5		6	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
LOW	1804	13	58	5	45	5	92	6	48	11	52	6
MODERATE	7561	54	323	30	274	31	487	34	180	42	257	28
HIGH	4560	33	694	65	561	64	842	60	204	47	608	66
Total acres	13925		1075		879		1421		434		917	

This erosion hazard mapping gives a broad scale picture of surface erosion potential; a more site-specific prediction of surface erosion was completed using the WEPP model as described in the aquatics section of this chapter.

UNSUITABLE SOILS

Affected Environment

The Umpqua National Forest (LRMP) describes the criteria used to determine soil suitability for tree harvest and states that harvest activities will occur only on lands classified as suited for timber production (LRMP IV-44 item 6). Unsuitable and/or sensitive soils are either unstable, “irreversible soil damage” lands, or have poor regeneration potential (Table 34).

The steep, highly dissected landscape that dominates the planning area has soils that are susceptible to landslides. Some areas are so sensitive to vegetation manipulation that soil and water resources cannot be protected without creating “irreversible soil damage” (LRMP B-8). These unsuitable areas include debris avalanches, earth slumps (active and rotational), and watershed areas that are upslope from unstable features. All are classified as “unsuitable” due to “irreversible soil damage” potential (Table 34). When these unstable areas were found within the proposed planning area, they were excluded from salvage activities (Figure 55).

Table 34. Sensitive Soils in the Baked Apple Planning Area.

Irreversible Soil Damage and Poor Regeneration Soils		Class Designation	Harvest Salvage Sale
Irreversible Soil Damage	Debris Avalanche	TLA	NONE
	Earth Slump (Active)	TLS	NONE
	Active Earth Flow	TLF	NONE
	Area of influence above soil movement	CU	NONE
Poor Regeneration	Very Shallow Soil	TRR	NONE
	Fragmental Gravels or Cobbles	TRG	NONE
	Suitable with Severe Regeneration Limitation	TES	YES

Soils with a very low moisture-holding capacity are classified unsuitable due to inherently poor regeneration potential. These soils are either very shallow (TRR) or rocky (TRG). All proposed harvest areas that included unsuitable soil areas greater than 5 acres in size were removed from the proposed action and its alternatives (Figure 54). Proposed units where unsuitable soil areas were excluded include: 9A, 9B, 15, 17, 18, 19, 25A, 28A, 40, 41A,

41B, 42, 43, 44, 46, 48, 49, 56, 57, 62A, 62B, 63A, 66, 67, 68, 69, 72, 73, 74, 75, 78A, 78B, 78F, 79A, 86, 87, 88A, 90, 93, 94.

Areas of unsuitable soils mapped during field reconnaissance will be incorporated into the forest database of unsuitable soil, as directed by LRMP IV-44, 7A and 7B. Between Draft and Final, the responsible official determined that any salvage in unsuitable soils areas greater than 5 acres in size would require a Forest Plan amendment for this project. Since no amendment was proposed, these areas have been dropped from consideration under Alternatives 4 and 6. All Alternatives are consistent with Forest Plan Standards and Guidelines regarding salvage harvest in unsuitable soil areas.

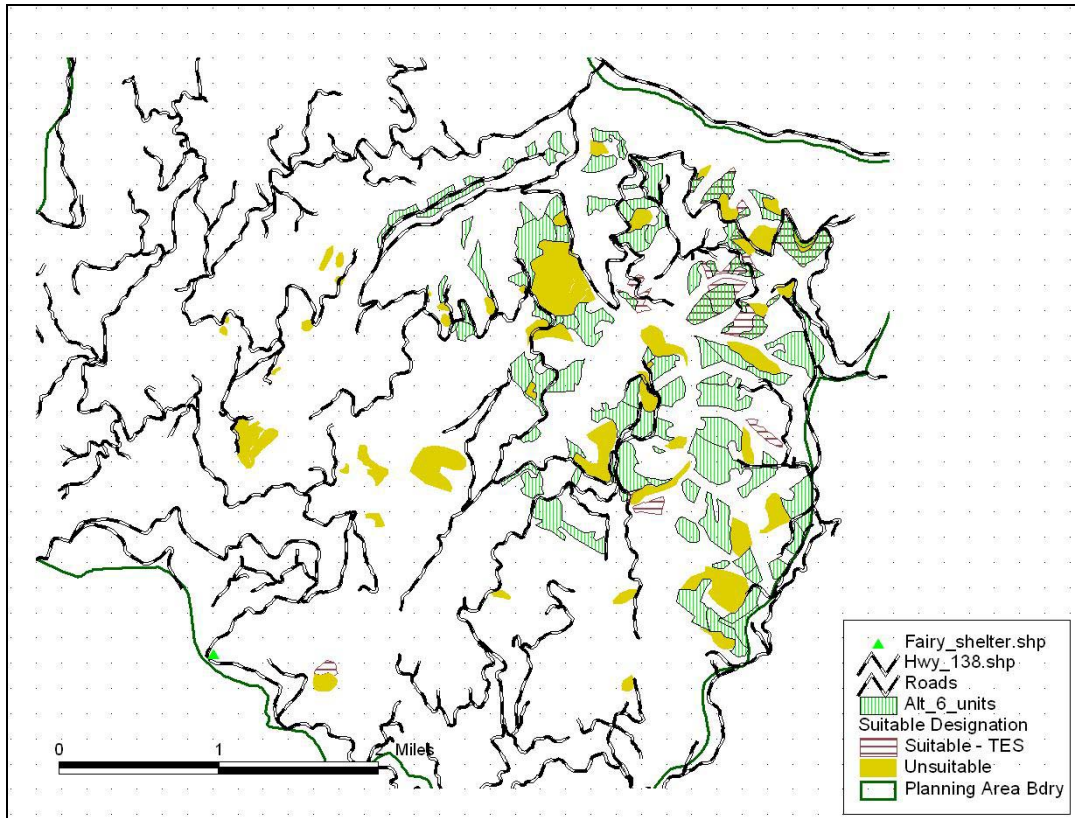


Figure 55. Unsuitable Soils Within the Baked Apple Planning Area, as shown for Alternative 6 (other alternatives are shown in the Soils Report).

Other soils that are suitable, but have severe regeneration limitations are considered “environmentally sensitive” (TES). TES soils in the planning area generally occupy droughty sites on ridge tops and steep south-facing slopes where soil depth and rock content limits water for plant growth. TES soils are suitable for timber harvest, but vegetative recovery on these sites is slow following disturbance such as fire and timber harvest.

BURN SEVERITY

The severity of the fire effects to the soil, or burn severity²⁴, was mapped using satellite imagery (Figure 56).

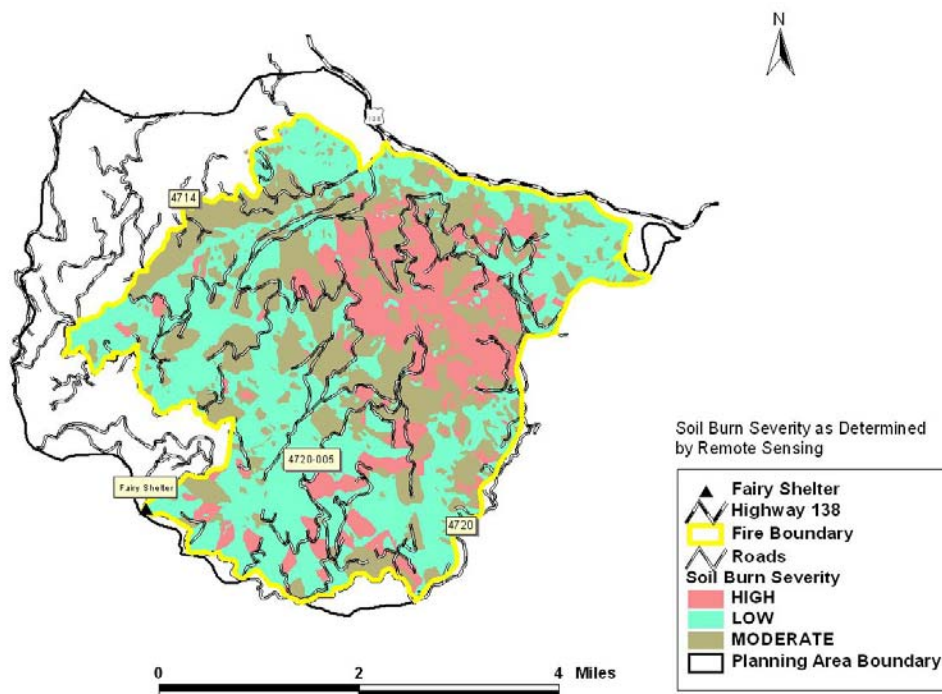


Figure 56. 2002 Apple Fire Soil Burn Severity Map.

Nine percent of the area burned within the planning area experienced high severity while more than 90% of the fire effects were either low or moderate (Table 34A). However, since tree mortality coincides with those areas that experienced more severe fire effects, high severity effects in harvest units range from 25% (alternative 5) to 42% (alternatives 3 & 6) of proposed activity areas.

²⁴ Fire severity is defined in terms of low, moderate and high. Low severity fires cause some soil heating and scorch; it can consume some leaf litter, but the duff layer is largely intact. Coarse wood is charred or partially consumed and no effects occur to the mineral soil. Moderate severity fires cause soil heating, moderate ground charring, consume the leaf litter, and consume the duff layer. Coarse woods, except for large logs, are consumed and the mineral soil is not visibly altered. High severity fires cause severe soil heating, deep ground charring, completely consume the duff layer, and alter the top portion of the mineral soil, turning it reddish or orange. Large logs are consumed or deeply charred. Soils can become fused. Continuous areas of hydrophobic soil conditions can occur.

Table 34A. Burn Severity in the Planning Area and By Alternative.

Severity Class	No Action		Alternatives									
			2		3		4		5		6	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
LOW	4370	47	149	14	118	13	233	16	152	37	100	11
MODERATE	4134	44	499	46	392	45	628	44	156	38	435	47
HIGH	863	9	428	40	370	42	561	39	105	25	389	42
Total Acres	9367		1075		879		1422		413		924	

The consumption of surface fuels and duff was widespread and accompanied by tree mortality in areas that experienced moderate and high burn severity. Field verification of the severity mapping indicated that high severity fire effects were actually less than indicated on the map (USDA 2003, Appendix A-7). Locations of high burn severity generally occurred in areas of heavy fuel loading, such as steep draws and riparian areas. These areas will not be salvaged. Within the salvage units, high severity areas were discontinuous across the units and these areas averaged less than 0.10 acres in size.

SOIL PRODUCTIVITY

Affected Environment

Soil productivity is irreplaceable in human timescales and should be protected (Beschta et al, 1995). Organic matter in the soil surface horizon plays a role in the regulation of water availability, movement and storage, soil structure and soil stability. Site productivity and recovery is often dependent on the amount of surface organic matter remaining in post-fire watersheds (Jurgensen et. al. 1997).

Oliver and Larson (1996) have documented that disturbances such as fire and harvest can release nitrogen into the soil. Immediate increases in readily available soil nitrogen can be attributed to the release of simple organic compounds from heat-disrupted soil organic matter and heat-killed microbial tissues (Choromanska and DeLuca 2001). The long-term consequences of nutrient losses on soil productivity are relational to how often and how severely the soil is burned. Soil productivity may actually increase where fire burns with low severity, as the available nutrients that were tied up in understory vegetation and forest floor organic matter are released to the surviving forest vegetation. However, management practices that remove remaining organic matter from low productivity sites after a wildfire may decrease soil productivity.

SOIL PRODUCTIVITY MANAGEMENT DIRECTION

To meet the goal of maintaining and enhancing soil productivity and stability in proposed activity areas, the following Umpqua National Forest LRMP (as amended) standards and guidelines were applied:

Soil Productivity Standard # 2 (LRMP, IV-68) - Effective Ground Cover levels are prescribed to meet acceptable levels of surface soil loss.

Soil Productivity Standard # 3 (LRMP, IV-68) - Surface Organic Matter to maintain soil productivity on sites with low nutrient levels and/or low water-holding capacity is provided by retention of additional snags and green trees on poor sites that experienced severe fire effects.

Soil Productivity Standard # 4 (LRMP, IV-68 and ROD, C-40) - Large Woody Material to maintain long-term soil productivity is provided by retention of snags and logs in numbers that exceed minimum guidelines and vary according to site specific needs (Umpqua National Forest, 1991, Forest Plan Amendment No. 1 and USDA & USDI, 1994).

Soil Productivity Standard # 5 (LRMP, IV-68 and ROD, B-14 and C-30) - Soil Mass Movement Potential has been evaluated and the risk of accelerating mass movement is minimized by excluding high risk land features from activity areas and, where applicable, including these features in Riparian Reserves adjacent to activity areas.

Soil Productivity Standard # 10 (LRMP, IV-71) - Mitigating measures will be developed and evaluated when detrimental soil conditions are expected as a result of the proposed action.

To meet the goal of maintaining and enhancing soil productivity and stability at the landscape/watershed scales in the Baked Apple Project Area, the following Umpqua Forest Plan (LRMP) guidelines and Aquatic Conservation Strategy concepts are applied:

Soil Productivity Standard # 1 (LRMP, IV-67) - the combined total amount of unacceptable soil conditions in proposed activity areas (compaction, displacement of surface soil and severe burning) should not exceed 20 percent, including areas in roads and landings.

Watershed Cumulative Effects and Water Quality (LRMP, IV-64) - To reduce or avoid the combined effects of timber harvest activities and fire effects on erosion processes, an assessment of potential cumulative effects to aquatic resources will be done (see aquatics section).

The Aquatic Conservation Strategy employs tactics to approach the goal of maintaining the “natural” disturbance regime, including the use of Watershed Analysis for characterizing watershed-scale ecological processes and desired conditions (ROD, B-9 and B-20).

Both the Wildfire Effects Evaluation Project (WEED) and the Middle North Umpqua Watershed Analysis characterize the current, historic and desired conditions for the Baked Apple Project Area in the context of the “natural” disturbance regime; The Aquatic Conservation Strategy is based on natural disturbance processes (ROD B-9). The pattern of vegetation in this forested landscape is largely shaped by fire.

The 2002 Apple Fire removed ground cover and created conditions that elevated surface erosion rates; this is especially true in steep, severely burned areas. Surface erosion from rainfall begins immediately following a fire and decreases dramatically as vegetation reestablishes itself in 3-4 years (Emerson 2003 and Elliot et al, 2001). Vegetation acts as a barrier and shields to the soil from the impact of raindrops. In fact, any material on the surface helps protect the soil from the impacts of raindrops that displace the soil. Effective ground cover includes rocks, limbs, tree boles, vegetation, etc. A surface erosion modeling of planning unit soil and topography showed the average pre-fire erosion rate to be 1% of post-fire rates during the first winter following the Apple Fire (Detailed discussion of surface erosion is found in Aquatics Section). Increased effective ground cover from logging litter can reduce soil loss in post-fire watersheds.

Modeling efforts generated existing ground cover estimates for all harvest units. The units (portions or all of the unit) which pre-harvest do not meet a minimum of 85% effective ground cover are: Units 9B, 15, 19, 25A, 25B, 39, 40, 43, 44, 45A, 45B, 45C, 48A, 48B, 57, 58C, 59A, 59B, 62A, 62B, 62C, 62D, 66, 68, 69, 72, 73, 74A, 74B, 75, 76, 77, 78A, 78C, 78D, 78E, 78F, 79A, 87, 88A, 88B and 89.

Environmental Effects

Direct Effects

The action alternatives affect soil productivity via vegetation growth, decay and fire disturbance, the inter-related processes that most affect nutrient cycles. Important soil resources affected include ground cover (duff), coarse woody debris and post-fire vegetation. In a simple way, these resources and processes interact in a “give-and-take” manner that affects the long-term storage and utilization of nutrients in the forest. Soil organic matter stores the nutrients that plants use and accumulate; fire releases or takes away those nutrients.

Forested sites that are most susceptible to productivity losses are the ones that store the least amount of organic matter and have the lowest potential productivity. In the Baked Apple Planning Area, these sites are plentiful. These sites are mostly steep and rocky with shallow soils and a southerly aspect. Many were affected by fire disturbance recently (1987 and 2002 Apple Fires) and are inherently slow to recover. Figure 56A shows the distribution of proposed treatment areas with severe fire effects and regeneration limitations in Alternative 6, as an example. The high burn severity units as displayed are those where severity mapping covered more than 50% of the unit area.

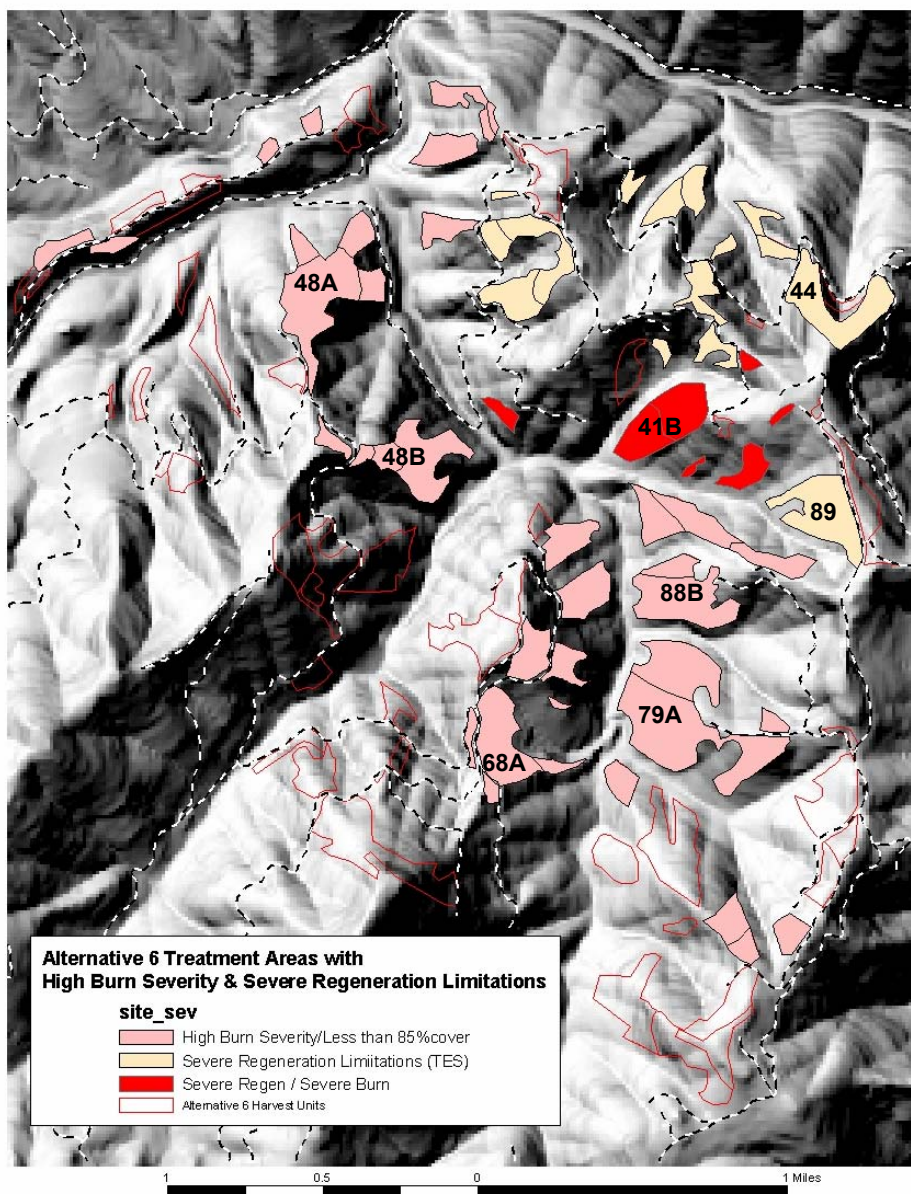


Figure 56A. Example of Salvage Areas with Severe Fire Effects and Regeneration Limitations. Alternative 6, With Selected Units Numbered, is Shown Here for Comparative Purposes.

EFFECTIVE GROUND COVER

Direct Effects

Post-fire logging slash would increase ground cover in harvest units. This increased cover from logging litter may reduce soil loss in post-fire watersheds to the extent that the newly forming duff fosters vegetation recovery, promotes infiltration and limits the overland flow of runoff (Shakesby et al, 1993). Overland flow is uncommon in soils with high infiltration capacity on steep slopes, except in the very shallow soils areas that are classified as unsuitable. These areas have been excluded from harvest.

As long as post-fire ground cover is maintained, surface erosion is not likely to be significant or prolonged. Surface erosion begins immediately following a fire and drops off dramatically as ground vegetation re-establishes itself within 3 to 4 years (Emerson, 2003 and Elliot et. al. 2001). Most all of the surface erosion following slash burns in an Oregon coast range study occurred the first year following fire with 65% of that first-year erosion occurring within 24 hours of the burn (Bennett, 1982). As vegetation regrows, the surface erosion rate typically decreases by 95% after the first winter (Robichaud and Brown, 1999). Post-fire surface erosion was observed within some of the proposed harvest units following the relatively light winter rains of the 2002/2003 rainy season. Pedestal formations, a sign of post-fire surface erosion, are evident in units 45A-C, 48, and 53.

To meet acceptable levels of surface soil loss, effective ground cover levels are prescribed based on the erosion potential of different landtypes and slope gradients (Soil Productivity Standard # 2 (LRMP, IV-68)). Minimum litter and duff needed for post-wildfire soils where harvest is proposed would meet the requirement for a steeply-sloping landtype with a very high erosion hazard, which is 85% effective ground cover (EGC), based on Forest Plan Direction.

Soil surface organic matter to maintain soil productivity on sites with low nutrient levels and/or low water-holding capacity is also provided by a ground cover prescription for the highest erosion hazard lands, 85% EGC [Soil Productivity Standard # 3 (LRMP, IV-68)]. This prescription is applied to poor sites that experienced severe fire effects or have severe regeneration limitations (Figure 56A).

Cable yarding and fuel treatments have the potential to decrease ground cover to the extent that slash, post-fire needle cast and recovering vegetation is displaced or consumed. This effect would be greatest where post-harvest underburn treatments are proposed. Risk of effective ground cover loss by alternative is proportional to underburn treatment acres (Figure 56B).

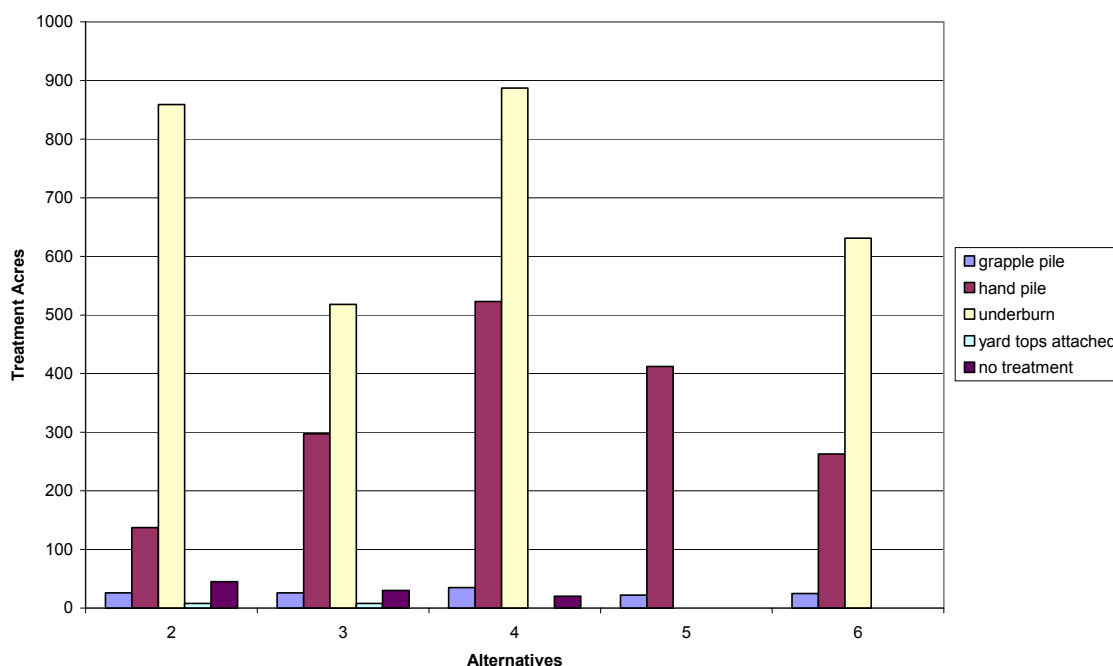


Figure 56B. Fuel Treatment Prescriptions by Alternative.

The yarding of trees would reduce ground cover along yarding corridors during operations, that represent as much as 5% of the cable harvest units and less than 1% of helicopter units. The burning of hand and grapple piles would affect a relatively small area of ground cover, as much as 4% of the area where this treatment is prescribed.

Estimates of ground area covered by post-harvest slash were generated for all harvest units. Combining pre- and post-harvest ground cover estimates provided a list of harvest units that may not meet a minimum of 85% effective ground cover (Table 34B).

Table 34B. Existing Ground Cover and Post-Harvest EGC Predictions in Harvest Units

Proposed Harvest Units with Less Than 85% EGC, the First Winter After the Fire (No Vegetation Regrowth Considered)	Proposed Harvest Units with <i>More Than 85% EGC</i> with post harvest slash added	Proposed Harvest Units with <i>Less Than 85% EGC</i> after addition of slash from proposed activities
9B, 15, 19, 25A, 25B, 39, 40, 43, 44, 45A, 45B, 45C, 48A, 48B, 57, 58C, 59A, 59B, 62A, 62B, 62C, 62D, 66, 68, 69, 72, 73, 74A, 74B, 75, 76, 77, 78A, 78B, 78C, 78F, 87, 88A, 89	9B, 15, 25B, 57, 59B, 66, 72, 73, 74A, 74B, 75, 76, 77, 78A, 78B,	19, 25A, 39, 40, 43, 44, 45A, 45B, 45C, 48A, 48B, 58C, 59A, 62A, 62B, 62C, 62D, 68, 69, 78C, 78F, 87, 88A, 89

The mitigation prescribed in Chapter 2 would maintain or enhance ground cover in harvest units with severe regeneration limitations, high burn severity or less than 85% post-harvest EGC (Figure 56A).

Indirect Effects

Post-fire logging followed by broadcast burning affects future stand structure and succession (Grifantini and others, 1991). Burning can aid the establishment of planted conifers by reducing competing vegetation. Burning can also favor fire resistant plants such as grasses and some pioneering plants such as *Ceanothus* species, which add nutrients to the soil (Sexton, 1994). Indirect effects of underburning slash and ground cover is proportional to underburn treatment acres (Figure 56B).

Cumulative Effects

Several areas proposed for salvage harvest underburned in the 1987 Apple Fire and reburned in 2002. Salvage harvest will increase ground cover while slash burning will risk a subsequent loss in ground cover. The combined effect of ground cover loss as a result of harvest and slash treatment is a loss in soil productivity that is proportional to harvest acres proposed by alternative, the greatest effects being in Alternatives 2 and 4 and the least in Alternative 5. Effects of slash treatment on ground cover loss are reduced in Alternative 3 and Alternative 6 by reduction in acres of underburn. On a harvest unit scale, that productivity loss is relatively large in those units located on poor sites (Figure 56A).

NUTRIENTS

Direct effects

Wildfires result in large nutrient losses that vary with burn severity and site potential (USDA, 2003). The burning of logging slash adds to wildfire losses, albeit a relatively small potential loss. Nutrient losses from slash burning occur from the consumption of nitrogen compounds and other nutrients contained primarily in the post-fire needle cast on the soil surface, with the loss being proportional to the heat of the slash fire. Nutrient losses can also occur via soil erosion. However, nutrient losses from eroded soil have an insignificant effect on site productivity, when compared to losses in the burned area associated with increased runoff of precipitation and channel erosion (Helvey and others, 1985).

Nutrient losses are expected to be proportional to differences in site productivity, with relatively large losses on poor sites that have less nutrient storage in the soil (USDA, 2003). The burning of slash would consume some of the post-fire nutrients in recovering vegetation and set back the vegetative recovery that keep nutrients on site. Soil surface organic matter that maintains soil productivity on sites with low nutrient levels and/or low water-holding capacity would be provided by a ground cover prescription for the highest erosion hazard lands [maintaining 85% EGC - Soil Productivity Standard # 3 (LRMP, IV-68)].

Slash burning has the potential to cause nutrient loss to the extent that post-fire needle cast and recovering vegetation is consumed. This effect would be greater where the post-harvest underburn treatments area proposed. Risk of nutrient loss by alternative is proportional to both underburn treatment acres (Figure 56B) and where severe wildfire effects and low site potential overlap (Figure 56C).

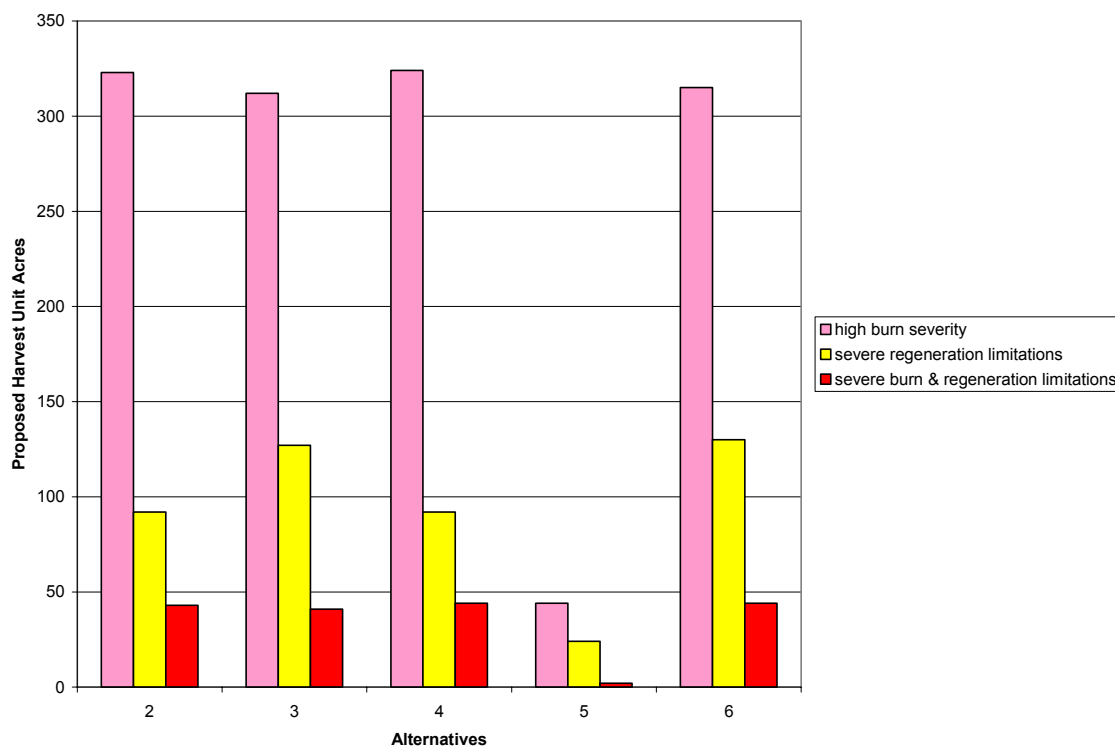


Figure 56C. Severe Burn Effects & Regeneration Limitations by Alternative.

The risk of nutrient loss associated with underburning and the harvest of poor sites is greatest for alternatives 2 and 4, less for Alternatives 6 and 3 due to reduced underburning, and least for Alternative 5 because of reduced harvest and less underburning acres (compare Figure 56C to Figure 56B). Risk reduction for underburning effects is accomplished through cool season (spring) burning and replacement of underburning with the hand-piling or lop-and-scattering of slash on poor sites.

Indirect Effects

Slash burning has the potential to cause nutrient loss indirectly via the killing of a post-fire regeneration of nitrogen fixing plants (*Ceanothus* species), if those species are present and are currently fixing nitrogen. These effects are proportional to underburning acres proposed. Alternatives 2 and 4 with the most underburning present the greatest potential for this indirect effect. On the other hand, long-term risk of nutrient loss associated with future fires is potentially decreased by the fuel reduction treatments proposed. Long-term risk reaches a maximum in approximately 25 years and is inversely proportional to post-harvest underburning acres proposed (Figure 56B).

The salvage operations would create an organic layer that would promote microsite conditions beneficial to the soil biota and vegetation. The slash created through salvage under Alternatives 2, 3, 4, 5, and 6 would increase the ability of the soil to retain moisture and help to buffer surface soil temperature fluctuations that are expected to

occur in this post-fire condition. Alternative 1 would not likely see this benefit initially, as material accumulation would be slower.

Cumulative Effects

The combined effects of nutrient loss depend on the likelihood of fire returning to the Apple fire vicinity. In the event of a fire reburning the same area in the next several decades, the harvest and slash treatments proposed have the potential to increase the risk of nutrient losses (if burning intensity is hot and duration is long) in proportion to underburn acres proposed by alternative, the greatest effects being in Alternatives 2 and 4 and the least in Alternative 5. Underburning effects are reduced in Alternatives 3 and, to a lesser extent, Alternative 6 through the use of alternate slash treatments, mitigation, or no treatment.

Slash treatments would reduce the risk of fire spread in the future and potentially decrease productivity losses associated with future fires. Under this scenario, risk of productivity losses is decreased in proportion to acres of salvage harvest and fuel reduction treatments to the extent that the treatments prevent fire spread. The uncertainty about future fire events and the effectiveness of fuel reduction treatments explains these apparent contradictions in cumulative effects on soil productivity.

COARSE WOODY DEBRIS

Coarse woody debris (CWD) enhances microsite conditions and habitat, but is not in itself a great source of nutrients. Nutrients captured in coarse wood are brought to CWD habitat by animals and recycled by decomposers such as fungi. The environmental effects of log removal are primarily through wildlife habitat alterations.

Direct Effects

Compared to no action, the direct effects of the proposed salvage logging would reduce levels of snag and coarse wood in harvest units. In terms of both short and long-term soil productivity, the tree harvest represents some fundamental tradeoffs to the nutrient cycle that organic matter fosters:

- Tree bole removal would remove a long-term source of organic matter, while reducing the risk of severe fire effects in the future by reducing fuel loading;

- Harvest activities would increase ground cover immediately by placing logging slash on the ground, but would reduce the localized benefits of logs in proportion to the amount of coarse wood removed.

Where harvest practices, tree retention and fuel reduction activities are the same for soils of different productivity, the magnitude of these direct effects on long-term soil productivity would be greatest on low productivity sites, where poor soils that are more susceptible to productivity loss are associated with reduced ground cover.

The risk of long-term productivity loss associated with tree harvest is greatest on poor sites because decomposition rates are higher, duff layers are thinner in the absence of

fire and fire returns more frequently than other sites. The effects of tree removal by alternative are proportional to acres of harvest on lands with severe regeneration limitations and retention levels proposed for harvest units on poor sites (compare Figure 56C to Figure 56D). The effects of CWD removal on poor sites are greatest for Alternatives 2, 4 and 6 due to similar harvest and retention levels on severe regeneration lands. These effects are intermediate for Alternative 3. Alternative 6 actually retains fewer trees on some poor sites and more on others than under Alternative 2. These effects are the least for Alternative 5 because of both reduced harvest and increased retention levels.

All action alternatives would leave enough coarse woody debris within harvest units to exceed Forest Plan Standards and Guidelines for maintaining long-term site productivity. Alternatives 3 and 6 retain large trees in amounts that reflect differences in the long-term potential productivity for different geographic areas (Plant Association Groups), a refinement of CWD retention guidelines for Matrix lands (USDA & USDI 1994, C-41).

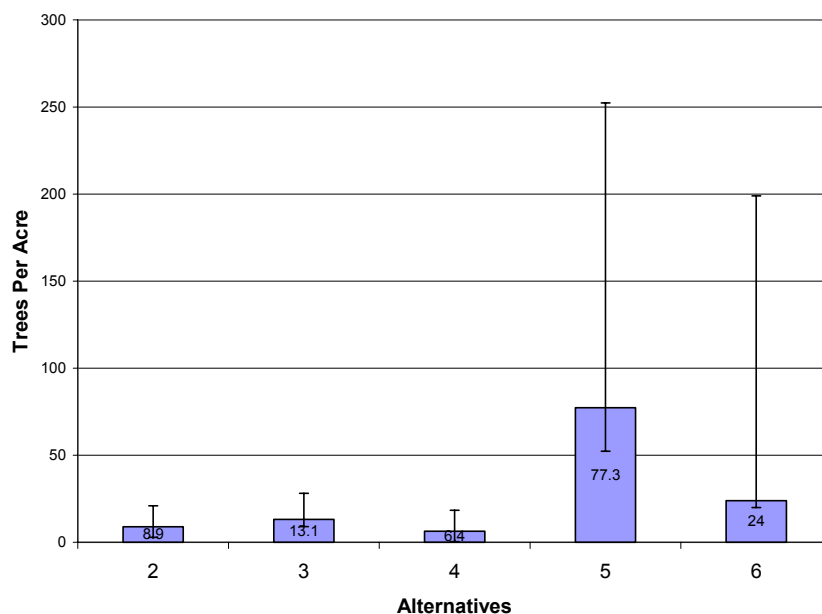


Figure 56D. Average Leave Trees per Acre on Poor Sites (units with severe burn and severe regeneration limitations).

Indirect Effects

Compared to No Action, the indirect effects of the proposed salvage logging and reduced levels of coarse wood are lower ground cover levels and less shade cast by the fire killed trees:

Tree bole removal would remove a long-term source of organic matter that would, if left on site, “rain” debris and wood fragments on the soil surface for decades,

aiding vegetative ground cover and providing a substrate to sustain the nutrient cycle.

Tree bole removal would remove a source of shade that would improve survival of planted conifers and natural seedlings. The sites most susceptible to reforestation failure are those have south aspects and shallow soils (see Figure 56A).

Tree bole removal would reduce the risk of severe fire effects in the future by reducing fuels.

Indirect effects of tree harvest are proportional to harvest acres and retention levels proposed for harvest units on poor sites (compare Figure 56C to 56D).

Cumulative Effects

In the western Oregon landscape, the combined effects of past timber harvest and post fire salvage have reduced the extent of dead tree patches, an important wildlife habitat as well as a component of long-term soil productivity (Umpqua National Forest, 2003b, p. 44). Approximately 34% of Panther Creek was harvested prior to the 2002 Apple fire. Currently, there are approximately 1,900 acres of dead tree patches (early seral with snags) greater than ½ acre in size in the Panther Creek sub-watershed area, or 15 % of this sub-watershed area (Umpqua National Forest, 2003b, Table 5A, Appendix A-14). The action alternatives propose to harvest 435 to almost 1,400 acres of these dead tree patches, or from 4 to 12% of the sub-watershed area.

The cumulative effects of proposed salvage harvest is proportional to the harvest acres proposed and inversely related to large tree retention levels (see Figure 43). In other words, less harvest and more retention would decrease these cumulative effects. The cumulative effect is greatest for alternative 4, increasingly less for alternatives 2, 6 and 3, respectively, and least for alternative 5. There would be no cumulative effects associated with Alternative 1, as no action would occur.

DETRIMENTAL SOIL CONDITIONS

Direct effects

The construction of temporary roads and use of existing temporary roads in conjunction with loader logging would have a small effect on soil productivity because temporary roads would be subsoiled and covered with slash. Alternatives 2 and 3 reconstruct 0.44 miles and construct 0.80 miles of temporary spur road, Alternative 4 reconstructs 1.27 and construct 1.05 miles of temporary spur roads, and Alternative 6 reconstructs 1.27 and constructs 0.93 miles of temporary spur roads. All old and new temporary roads used for this project would be rehabilitated. The rehabilitation treatments include subsoiling the road surface, replacing berms of displaced topsoil along the sides of the road, and placing harvest slash on the surface of treated roads (see Chapter 2 mitigation and the Soils Report in the Appendix for specificity). Site productivity would be mitigated by replanting of the road prism once it is rehabilitated.

Observations of this practice at Diamond Lake RD and the SOAR²⁵ (Soil Organic Amendment Restoration) study on North Umpqua RD, have shown that adding organic matter to rehabilitated roads increased the soil moisture content, reduced soil surface crusting, and decreased surface erosion.

Direct effects of logging on soil compaction and displacement are proportional to the acres of loader logging proposed for each alternative. Loader logging would occur on 200 acres under Alternative 4, 194 acres of Alternative 5, 50 acres of Alternative 6 and 30 acres under Alternatives 2 and 3. Loader logging would occur on existing and new skid trails. The ridge-top landform where new skid trails are proposed have high soil strength in undisturbed areas and rehabilitation of loader skid trails is not anticipated to be needed.

The combined detrimental soil effects of past, present, and foreseeable activities including compaction and displacement of topsoil are displayed in Table 35. Alternative 4 would increase detrimental soil conditions because it proposes the most harvest acres. Alternatives 3 and 5 create the fewest acres of impact. These estimates of detrimental soil conditions include the impacts of previous and proposed harvest activities.

Table 35. Estimated Detrimental Soils Conditions Due to Compaction and Displacement Within the Salvage Units.

Alternatives	Proposed Harvest		Historic Harvest within Proposed Units		Combined past and Proposed Harvest Effects	
	Acres	Soil Displacement & Compaction (acres)	Acres	Existing Displacement & Compaction (Acres)	Acres	Combined Displacement & Compaction (% of Alternative Acres)
2	1075	42	230	12	54	5%
3	880	36	197	10	46	5%
4	1430	73	374	19	92	6%
5	435	36	199	10	46	11%
6	952	46	205	10	56	6%

Alternative 4 has the greatest total soil compaction and displacement with 92 acres. Alternatives 3 and 5 have the fewest combined acres of impacts. To estimate detrimental soil impacts from previous and proposed activities, the following assumption about the area affected by different logging systems was used: Loader Logging - 10%, Skyline Logging

²⁵ This study is designed to determine the effectiveness of placing Class A biosolids (waste water treatment products) and wood chips on roads that have been decommissioned in order to improve site productivity.

- 5%, Helicopter Logging - 2%. In general, existing detrimental soil conditions due to past harvest are relatively low in the proposed units and the planning area because the majority of the previous harvest used skyline harvest methods.

Harvest units in all action alternatives are estimated to have compacted or displaced soil areas that cover less than 15% of the harvest unit, including 5% of area in existing roads and landings. These impacts are less than the 20% Guideline (Soil Productivity Standard # 1 (LRMP, IV-67)).

The heat generated from burning of grapple slash piles would add to detrimental soil effects on those areas that have experienced severe burning from the 2002 Apple Fire. Piles would cover as much as 4% of the unit area where hand piling is prescribed. Underburning would *not* create severe burn effects because the slash is not as concentrated as it is in piles, and the broadcast burning would be done during the cool season. Areas of severe burning resulting from the burning of piles would be proportional to acres of hand and grapple piling by alternative (Figure 56B). Slash pile burn effects would be greatest for Alternative 4 and less for Alternatives 3, 5 and 6 where ground cover and post-fire vegetation is protected on poor sites by substituting slash piling for underburning. Alternative 2 would have the least amount of severe burn effects due to the piling and burning of slash.

Indirect Effects

The indirect effects of detrimental soil conditions are losses to soil productivity and vegetation recovery after the wildfire. The effects are proportional to both acres of soil compaction/displacement (Table 35) and acres of grapple slash piles by alternative (Figure 56B). These combined indirect effects would be greatest for Alternative 4 and less for Alternatives 3, 5 and 6 where ground cover and post-fire vegetation is protected on poor sites by substituting slash piling for underburning, as described in the fuels mitigation measures in Chapter 2. Alternative 2 would have an amount of loader logging comparable to other alternatives, but less severe burn effects because of fewer acres of slash piling and burning.

Cumulative Effects

The detrimental effects of the action alternatives would add incrementally to the effects of the 2002 Apple Fire burn severity and the legacy of detrimental soil conditions from past management. These detrimental effects include reduced ground cover and soil displacement during logging, severe burning of soil from the burning of grapple slash piles, and soil compaction from equipment operation.

The concentration of proposed harvest in areas of high burn severity indicates that areas of high burn severity represent the single most prevalent detrimental soil condition in proposed activity areas (Figure 56C and Table 34A). Mitigation, as described in Chapter 2, is designed to enhance ground cover and minimize additional detrimental soil conditions in salvage harvest units, particularly on poor sites where risk of long-term productivity losses are greatest.

The combined effects of past and proposed management activities on soil conditions would be small compared the effects of the wildfire on ground cover, nutrients and vegetation growth. The greatest potential cumulative effects of proposed management

activities to detrimental soil conditions would result from the underburning and grapple pile burning of harvest-related slash. New, temporary roads and landings would be rehabilitated. Mitigation of the detrimental effects of logging systems and site preparation would be applied by prescribing methods that minimize or rehabilitate compaction, displacement of topsoil, and severe prescribed fire effects. These mitigation measures include skyline and helicopter logging systems that minimize soil compaction and displacement. Alternative slash treatments are prescribed to replace broadcast burning, particularly on severe sites (no treatment, lop-and-scatter, pile burning, or jackpot burning). The cumulative effects of the proposed salvage logging, landing construction and fuel reduction activities on soil productivity would be small or undetectable.

SOIL BIOLOGY AND MYCORRHIZAE

Affected Environment

Soil biological processes and their importance in nutrient cycling and maintenance of soil structure have garnered much attention in recent years. The roles of mycorrhizal fungal populations in forest stand nutrition are well-known (Perry et al 1987). Soil fauna, such as soil bacteria, earthworms, beetles, termites, etc., help sustain site productivity by stirring surface organic matter, creating channels for drainage and aeration, and reducing organic matter into smaller pieces for continued decomposition (Perry et al 1987).

During field examination of the Baked Apple proposed harvest units, the soil burn severity was determined using criteria from the Apple Fire Burned Area Emergency Response (BAER). Soil examinations in the fire area did not show fire alteration to a depth that would affect the long-term soil resource. Though the surface organic matter (duff) was lost in units with high severity burns, soil structure had not changed. Fine roots were present near the mineral surface and fungal mats did not appear to be heat altered. The long-term survival of these mats is not known, but it is anticipated that they may be able to subsist on the decaying matter left by the fire. Mycorrhizae is more heat sensitive than bacteria (Choromanska and DeLuca 2001), therefore, bacteria has likely been minimally affected below the mineral soil surface.

Environmental Effects

Direct and Indirect Effects:

Reforestation of the harvested area would include inoculation of bare root stock with mycorrhizal fungi spores mixed with water and Terrasorb right before outplanting. Although the spores of mycorrhizae are considered ubiquitous, there would be a beneficial indirect effect of increased seedling survival by adding concentrations of mycorrhizae to the soils in the immediate root zone of the planted seedlings (Amaranthus et al, 1996). In addition, mulch mats would be installed. Larger seedlings (Plug+1²⁶ stock type) would be planted on harsh, droughty, and rocky sites.

Cumulative Effects:

Cumulative effects with regard to mycorrhizae would likely show a benefit in the survival of trees planted in the reforestation efforts. These trees would then promote conditions

²⁶ Plug one stock type are seedlings grown one year in a container at a nursery, then transplanted out into a bed of soil the second year.

to increase the size of these fungal colonies, which, in turn would add to the nutrient cycle over time.

CARBON CYCLE/CARBON SEQUESTRATION

Affected Environment

Carbon sequestration refers to the process of removing carbon dioxide from the atmosphere, breaking it down into elemental carbon, and storing it in living plants, dead wood, leaf litter, and soil organic matter. Forested ecosystems make an important contribution to the total global carbon budget, including absorption and release of carbon (standing biomass, coarse woody debris, and soil carbon). The effects of this project on carbon are difficult to predict; however, retention of coarse woody debris and snags, and maintenance of effective ground cover would maintain the carbon storage capacity at both the stand and landscape scales.

Environmental Effects

Directs Effects:

Although not quantitatively measured for this project, the direct effect of harvesting on carbon storage would be a loss of carbon to the individual harvest units. This reduction in carbon (tree boles) would occur in addition to the losses to carbon that occurred from the fire (as organic matter burned). Alternatives 4, 2, 6, 3, and 5 (greatest to least impact on harvest units) would remove carbon stored in tree boles. Dependent upon the time needed for natural regeneration Alternative 1 would take the most time to establish vegetation (stands of timber), which would be beneficial to the long-term sequestration of carbon. All other alternatives would begin sequestration dependent upon the harvest and planting schedules proposed (see Silvicultural Prescription).

Indirect Effects:

However, the sequestration (addition) of carbon with planted and naturally regenerating trees and shrubs would begin to make up for this loss. If the wood proposed in this harvest is converted to a product such as homes or furniture, in two hundred years, carbon sequestered or stored by the reforested harvest units could exceed the carbon removed during harvest (Kimmins, 1996). Ultimately the fate of harvested carbon “determines whether or not logging... increases or reduces” carbon levels (Kimmins, 1996).

Cumulative Effects:

Minimal cumulative effects to carbon storage would occur under all alternatives. The amount of above ground stored carbon (tree boles) in proposed units shall be reduced through harvest. However there is no intent to convert the proposed activity acres from forest to non-forested lands; thereby the short flux in carbon storage will not affect the amount of stored carbon, (Bouwman and Leemans 1995). The assumption by these authors was that deforestation would fail to protect soil as carbon not forest management.

THREATENED, ENDANGERED AND SENSITIVE (TES) PLANTS

Affected Environment

A Biological Evaluation (BE) documenting effects to rare plants due to implementing this project is included in the project file and incorporated by reference. There are 33 Sensitive plant species currently documented or suspected to occur on the Umpqua National Forest (Table 36).

The Record of Decision (ROD) to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines was signed on March 22, 2004; it goes into affect on April 21, 2004. Many of the species formally known as Survey and Manage species are eligible or are already on the Pacific Northwest Region's Sensitive Species List. As indicated on Table 2-4 (p. 48) of the Final Supplemental Environmental Impact Statement (FSEIS), January 2004, the number of Survey and Manage plants and fungi eligible to be included, and not already listed, on the region's Sensitive Species List include:

Fungi	36
Lichens	22
Bryophytes	4
Vascular Plants	0

The possible (it will not be final until an amended Sensitive Species List is issued) numbers of newly-listed sensitive plants/fungi for the Umpqua National Forest are as follows:

Fungi	9
Lichens	9
Bryophytes	1
Vascular Plants	0

The Biological Evaluation (BE) for Sensitive Plants fully complied with current Survey and Manage Standards and Guidelines and existing Special Status Species Policies when it was originally compiled. Because it fully complied with the new policies, further survey work is not necessary (S&M ROD and page 46 of the S&M FSEIS).

Table 36. Sensitive Plant Species for the Umpqua National Forest.

Common Name	Latin Name	Potential Habitat in Planning Area?
Horizontal woody rock-cress	<i>Arabis suffrutescens</i> var. <i>horizontalis</i> (Greene) Rollins	N
Mt. Shasta arnica	<i>Arnica viscosa</i> Gray	N
Grass fern	<i>Asplenium septentrionale</i>	Y
Wayside aster	<i>Eucephalus vialis</i>	Y
Lance-leaved grape-fern	<i>Botrychium lanceolatum</i>	N

Common Name	Latin Name	Potential Habitat in Planning Area?
Mingan moonwort	<i>Botrychium minganense</i>	N
Crater Lake grape-fern	<i>Botrychium pumicola</i>	N
Brewer's reedgrass	<i>Calamagrostis breweri</i>	N
Umpqua Mariposa lily	<i>Calochortus umpquaensis</i>	N
Crawford's sedge	<i>Carex crawfordii</i>	N
Twotooth sedge	<i>Carex serratodens</i>	N
Tall bugbane	<i>Cimicifuga elata</i>	Y
Mount Mazama collomia	<i>Collomia mazama</i>	N
Clustered lady's-slipper	<i>Cypripedium fasciculatum</i>	Y
Umpqua fraseria	<i>Frasera umpquaensis</i>	N
Siskiyou fritillaria	<i>Fritillaria glauca</i>	Y
Newberry's gentian	<i>Gentiana newberryi</i> var. <i>newberryi</i>	N
Whitney's hazardia	<i>Hazardia whitneyi</i> var. <i>discoidea</i>	N
California globe-mallow	<i>Illiamna latibracteata</i>	Y
Dwarf isopyrum	<i>Isopyrum stipitatum</i>	Y
Umpqua kalmiopsis	<i>Kalmiopsis fragrans</i> sp. nov.	Y
Columbia lewisia	<i>Lewisia columbiana</i> var. <i>columbiana</i>	N
Quill-leaved lewisia	<i>Lewisia leeana</i>	N
Kincaid's lupine	<i>Lupinus oreganus</i> var. <i>kincaidii</i>	N
Howell's montia	<i>Montia howellii</i>	N
Adder's-tongue	<i>Ophioglossum pusillum</i>	N
Coffee fern	<i>Pellaea andromedifolia</i>	N
Red root yampah	<i>Perideridia erythrorhiza</i>	N
California swordfern	<i>Polystichum californicum</i>	Y
Thompson's mistmaiden	<i>Romanzoffia thompsonii</i>	Y
Swaying bulrush	<i>Scirpus subterminalis</i>	N
Columbian water-meal	<i>Wolffia columbiana</i>	N
Northern water-meal	<i>Wolffia borealis</i>	N

One species, Kincaid's Lupine is listed as Threatened throughout its range. Based on the review of aerial photographs, soil inventories, elevation zones, and plant associations for the area, it was determined that the project area may have potential habitat for the following Sensitive vascular plant species: grass fern; tall bugbane; clustered ladyslipper; wayside aster; Siskiyou fritillary; California globe mallow; Siskiyou false rue anemone;

North Umpqua Kalmiopsis; California swordfern; and Thompson's mistmaiden. See the Botany Biological Evaluation for detailed information on these species.

Field reconnaissance determined that there is one known occurrence of the Sensitive plant, Thompson's mistmaiden, within the Baked Apple Salvage Timber Sale project boundary, near unit 59A. Thompson's mistmaiden (*Romanzoffia thompsonii* V.M. *Martalla*) is a diminutive, herbaceous, annual plant belonging to the water leaf (*Hydrophyllaceae*) family. This is the only species of *Romanzoffia* that is annual and bulbless. It has small white flowers with a yellow dot at the inner base of each petal. The plant usually produces only a few rudimentary leaves and one to several small flowers, typically blooming in early spring, but sometimes blooming later if ideal conditions persist. The plants habitat occurs within small to large forest openings where shallow bedrock creates moist seeps. It roots in the mosses and other small vegetation that cling to the exposed bedrock. No other species are known to occur in the planning area.

Environmental Effects

Alternative 1 & 5

Direct, Indirect & Cumulative Effects:

Implementing Alternative 1 would not have any direct, indirect or cumulative impacts upon any listed Threatened, Endangered or Sensitive plant species. Plant communities will change through natural post-fire succession, which may have the potential to produce negative or positive effects to Sensitive plants over time, depending on which plant species reproduce throughout the area. If Alternative 5 is chosen then no direct, indirect or cumulative impacts would occur to any Sensitive plants because unit 59A is excluded from this alternative.

Alternative 2, 3, 4 & 6

Direct Effects:

These alternatives propose harvesting unit 59A. A meadow below unit 59A has the Sensitive plant Thompson's mistmaiden growing in it. The unit boundary is approximately 70 feet from where the plant population is occurring. The unit is proposed to be helicopter or skyline logged so there likely would not be any logging equipment or direct trampling in the meadow. There is potential for trees to be felled on the plants and consequently skidded through the population therefore directional felling away from the meadow will be implemented as a mitigation measure on the western portion of the unit. Harvesting unit 59A would not result in direct impacts to this population of Thompson's Mistmaiden. No direct impacts would occur to any other Sensitive plants because no known sites occur within the planning area.

Indirect & Cumulative Effects:

Harvesting unit 59A above the meadow where Thompson's mistmaiden is growing may indirectly impact the population or the habitat, but will not likely contribute toward federal listing or cause a loss of viability to this species on the Umpqua National Forest. Indirect effects may occur if harvesting causes any drying effects to the vernal moist seeps that the plant depends on. This plant is not dependent upon shade or canopy, in fact, it always occurs in open sun within meadows with shallow bedrock. The plant colonizes areas where seeps stay moist in early spring. Cumulative impacts would not occur because no other projects in the past, present or foreseeable future would impact

this site. No other Sensitive plants were found within the planning area or were known to occur in the planning area prior to the fire; therefore, no indirect or cumulative impacts would occur to any other rare plants.

SPECIES PREVIOUSLY KNOWN AS SURVEY AND MANAGE PLANTS AND FUNGI

Affected Environment

The fungi *Bridgeoporus nobilissimus* (W.B. Cooke) Vok, Burdsall & Ammirati X, the Lichens *Leptogium cyanescens* (Rabenh.), *Nephroma occultum* Wetmore, and *Pseudocyphellaria rainierensis* Imshaug would be considered as sensitive under the new S&M ROD. Very little habitat for these botanical species exists within the Baked Apple Fire Salvage project area. This is mostly due to the high intensity fire that took place during the summer of 2002. Potential habitat was delineated and surveyed by the Diamond Lake/North Umpqua district botany crew during April, May and June 2003. The Survey and Manage Report, as amended is incorporated by reference and summarized here; see this report for detailed information on these species. Potential habitat occurs within the planning area for the following species: *Leptogium cyanescens*; *Nephroma occultum*; *Platismatia lacunose*; *Pseudocyphellaria rainierensis*; *Ramalina thrausta*; *Schistostega pennata*; *Tetraphis geniculata*; *Cypripedium fasciculatum*; and *Eucephalus vialis*. There are no previously known populations of any Survey and Manage botanical species within the planning area; consequently, none of these species, now that they will be considered Sensitive, are known to occur in the planning area.

Environmental Effects

Direct, Indirect and Cumulative Effects:

The results of the surveys showed that there are no new sites of any of the above mentioned species. In addition, no species from other previously known as Survey and Manage species category B, D, E or F were located. Therefore, implementing any of the alternatives within the Baked Apple Fire Salvage Project would have no direct, indirect or cumulative impacts on any previous Survey and Manage, now Sensitive species.

NOXIOUS WEEDS

Affected Environment

The noxious weed risk analysis is incorporated by reference and is found in its entirety in the Project Record. Eight species of noxious weeds listed by the state of Oregon and the Umpqua National Forest as invasive were found to be occurring within the Baked Apple planning area and are displayed in Table 37.

Not all the species on the list will be treated, as some are too abundant and have become naturalized. The list is based on the Oregon Department of Agriculture (ODA) state noxious weed list. "A" rated weeds are those species which are non-native invasive plants and at present can be treated and possibly eradicated through intensive control methods. "B" rated weeds are those plants which are non-native and invasive but have become so abundant that intensive control methods have been rendered infeasible, so control of seed spread has become the main management strategy. No detection species are found in the planning area.

Table 37. Noxious weed species found in the planning area.

Common Name	Scientific Name	Forest Rating	Present in project area	Tracked & Treated
High-Priority Species				
Diffuse knapweed	<i>Centaurea diffusa</i>	A	YES	YES
Scotch broom	<i>Cystisus scoparius</i>	A	YES	YES
Lower-Priority Species				
Meadow knapweed	<i>Centaurea debeauxii</i>	B	YES	YES
Bull thistle	<i>Cirsium vulgare</i>	B	YES	NO
Canada thistle	<i>Cirsium arvense</i>	B	YES	YES
St. Johnswort	<i>Hypericum perforatum</i>	B	YES	NO
Himalayan Blackberry	<i>Rubus discolor</i>	B	YES	NO
Tansy ragwort	<i>Senecio jacobaea</i>	B	YES	YES

Meadow knapweed was found to be the most abundant weed within the planning area, as was expected. This species was planted along roads and skid trails across the North Umpqua Ranger District in the 1960's and 70's to help mitigate erosion. The plant found the Umpqua to be very suitable for reproduction and colonization and has since spread to hundreds if not thousands of acres on the forest. It is mostly confined to roadsides, although it has been found spreading into clearcuts and areas blackened by fire. It is a perennial plant with a deep rooting fleshy taproot. The best treatments to prevent further spread, to date, seem to be biological controls and weed eating the flowering heads as they bolt. A research study is ongoing on the Umpqua NF and Roseburg BLM to find the most successful biological controls (insect species) to predate on Meadow Knapweed.

Diffuse knapweed was found only in one spot at the end of a spur road, with about 50 plants present. The site was pulled and will be monitored in future years. This is a very invasive species that could wreck havoc within the watershed if it were allowed to spread. It has become a scourge in areas of Idaho and Montana.

Canadian thistle was located in several spots within the planning area along roadsides. This thistle species is widespread and nearly naturalized though does not appear to be as abundant at higher elevations and harsher sites. Canada thistle is not very abundant in the planning area and can easily be treated through pulling to keep it from spreading further.

Bull thistle occurs throughout the watershed and across the entire Umpqua NF. This plant is still listed as a noxious weed by the State, but because of its abundance on the Forest, is not tracked or treated. It is basically considered naturalized at this point.

Scotch broom is a weedy shrub found scattered along roadsides in a number of places within the planning area. It seems that the elevation and topography may be keeping this species from becoming a big problem in this watershed.

St. Johnswort, like bull thistle, is so abundant that no current treatment methods are feasible to hold the plant in check. However biological controls are still released, with little positive results observed. Ecologically, this species probably does the most damage to native plant habitat as it encroaches on unique meadows at almost all but the highest elevations.

Himalayan blackberry was found to be more abundant than expected. Clumps of blackberry were found mostly along roadsides, but nearly throughout the watershed, although very scattered and patchy. It will be very important to treat this species now while it is still controllable.

Tansy ragwort was surprisingly not abundant in the watershed. Only a few sites were found with relatively few plants at each site. It should not be difficult to keep Tansy under control within the planning area.

The Baked Apple planning area is infested with approximately 65 acres of the six noxious weed species that are being tracked and mapped. Table 38 shows a breakdown of acres of weed species that are found within the boundaries of each alternative.

Table 38. Acres of Tracked Noxious Weed Species By Alternative

Weed Species	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Meadow Knapweed	59	35.5	51	38	25
Diffuse Knapweed	0.5	0.5	0.5	0.5	0
Himalayan Blackberry	1.5	0.75	1.5	1.5	1.5
Scotch Broom	1	0.25	1	1	0
Canadian Thistle	1	0.25	1	1	0.75
Tansy Ragwort	0.1	0	0.1	0.1	0

Environmental Effects

Alternative 1

Direct, Indirect and Cumulative Effects:

Implementing alternative 1 would not result in direct, indirect or cumulative impacts in regards to the spread of noxious weeds across the landscape. Weeds would probably still spread through natural or unnatural vectors by way of wind or vehicle traffic. The area would be monitored and weeds would be treated as necessary using limited appropriated funds.

Action Alternatives

Direct, Indirect and Cumulative Effects:

Alternative 2 has an estimated 63 acres of noxious weeds within the KV boundary; Alternative 3 has 38 acres; Alternative 4 has 55 acres; Alternative 5 has 42 acres; and Alternative 6 has 31 acres of noxious weeds within the KV boundary. Implementing the Best Management Practices (BMP's) and mitigation measures stated in Chapter 2 would result in no direct, indirect or negative cumulative effects in relation to noxious weeds spreading on the landscape. Pre-treatment of weeds within the planning area during the summer of 2003 and repeated treatment in the summer of 2004 would drastically reduce the risk of weeds being spread by the proposed activities. In addition, weeds would be monitored for, then treated if they are present post-harvest for up to five years using Knutsen-Vandenberg funding, resulting in a beneficial cumulative effect of reducing weed populations over time. In terms of effectiveness, Alternative 2 is the most effective followed by (in terms of most to least effective) Alternatives 4, 5, 3, and 6.

INSECTS

Affected Environment

Several species of bark beetles and woodborers are common native insects in the forests of Southwest Oregon. In response to comments submitted on the DEIS, the beneficial role of insects is described. Bark beetles and woodborers are native insects that are natural components of Southwest Oregon forest ecosystems. Their beneficial roles include the following:

- 1) Subcortical beetles serve as food for other animals. Since they spend almost their entire lives in wood or at least under bark, they are well protected and represent rather specialized food sources. They are mainly fed upon by birds such as woodpeckers, and predacious insects.
- 2) Bark beetles and woodborers are agents of diversity. Many bark beetles and woodborers are very host specific. They kill some tree species more readily than others, selectively leaving other species over their preferred hosts in areas where they are active.
- 3) Bark beetles and woodborers play significant roles in promoting forest tree vigor. They often preferentially kill low vigor hosts and not more vigorous individuals. Bark beetles can regulate stand densities especially in situations where inter-tree competition causes significant vigor decline in some trees. Unfortunately, the choice of hosts by bark beetles and woodborers may not be consistent with some management objectives. Bark beetles tend to thin from above. Also, they often kill trees in groups rather than selecting well spaced individuals.
- 4) Bark beetles and woodborers play important roles in nutrient recycling. They accelerate the rate of decomposition of dead wood by vectoring decay fungi, providing avenues of access for fungi through bark and into wood, and by reducing the wood that they feed on into smaller particles that are more readily decomposed.

Bark beetles and woodborers prefer live hosts that are under some degree of stress. Some woodborers also attack dead trees. When bark beetle populations are at endemic²⁷ levels, they almost always infest host trees that are injured, diseased, or of low vigor because of intense competition for water and/or other resources. Only when populations build to epidemic²⁸ levels are healthy, vigorous trees likely to be attacked. The most significant bark beetles and woodborers known to occur in and around the area affected by the Apple fire are:

- Douglas-fir beetle (*Dendroctonus pseudotsugae*) on Douglas-fir
- Mountain pine beetle (*D. ponderosae*) on sugar pine
- Fir engraver beetle (*Scolytus ventralis*) on white fir and, occasionally western hemlock
- Cedar bark beetles (*Phloeosinus spp.*) on western redcedar and incense-cedars.
- Flatheaded and roundheaded woodborers (Families *Buprestidae* and *Cerambycidae*)
- Ambrosia beetles (Family *Scolytidae*)
- Wood wasps (Family *Siricidae*)

In the seven years prior to the burn, the cooperative Region 6/State of Oregon Annual Aerial Mortality Survey shows that tree-killing insect activity in the Apple fire area involved very low levels of mountain pine beetle on sugar pine and a buildup and collapse of Douglas-fir beetle. Douglas-fir beetle-killed trees were detected in substantial numbers both as scattered individuals and dead trees in groups of 10 to 50 in 1998, 1999, and 2000. Numbers decreased greatly in 2001 and had subsided to very low levels by 2002 when the fire ignited. This Douglas-fir beetle episode was typical of what happened over much of the southern Cascades during the same time period and was attributed to population build-ups in numerous down Douglas-fir, windthrown or broken by significant storm events in the winter of 1996-97.

The watershed analysis prepared for the Middle North Umpqua covers the drainages within the Apple Fire perimeter. It identifies mountain pine beetle and Douglas-fir beetle as endemic insects and indicates that outbreaks of the latter species may occur following large storms that cause substantial amounts of blowdown.

Environmental Effects

Direct Effects

It is well documented that both bark beetles and woodborers readily infest trees injured but not killed outright by fire (Miller and Keen 1960, Furniss 1965, Furniss and Carolin 1977, Fischer 1980, Peterson and Arbaugh 1986, Thomas and Agee 1986, Harrington 1987, Weatherspoon 1988, Ryan 1990, Swezy and Agee 1990, Ryan and Frandsen 1991, Flanagan 1996, Scott et al. 1996, Weatherby et al. 2001). In fact, the vast majority of fire-injured trees that die in the years immediately following a burn (often as much as the following 4 or 5 years) are infested by bark beetles and/or woodborers. The particular insects involved vary by host conditions and species. Observations on numerous fires in Southwest Oregon and northern California have demonstrated that the same would hold

²⁷ An endemic level is one that naturally occurs.

²⁸ An epidemic is a temporary, wide-spread outbreak.

true for the Apple fire area. There are clearly many fire-injured conifers within the perimeter of the Apple fire that were damaged sufficiently to predispose them to insect infestation.

For this analysis, the Southwest Oregon Forest Insect and Disease Service Center guidelines were used to predict risk of bark beetle and/or woodborer infestation for a fairly large sample of still-living trees in the area affected by the Apple Fire. This rating system was selected because it is tailored to Southwest Oregon tree species and is conservative. Overall, this analysis suggests that about 40 percent of the still living conifers in the sample have a high probability of being infested by insects in the next 5 years. This holds true for all alternatives because none of the alternatives plan to harvest live trees impacted by the Apple fire. Further, it indicates that some species and size classes have greater likelihood of being impacted by insects than others.

In early spring 2003, there was little evidence of insect activity on either dead, fire-killed trees or live fire-injured trees within the perimeter of the Apple fire. However, it was predicted in the DEIS that bark beetle and woodborer activity could be substantial in the fire area once the season progressed and the flight periods for the insects arrived. Evaluating the situation now, shows that: 1) In the time since the fire, substantial numbers of fire-killed trees have indeed been infested by insects, mainly woodborers in the families *Cerambycidae* and *Buprestidae*; 2) About 20 % of trees in a monitored, random sample of trees that were injured but not killed outright by the fire have died, mostly exhibiting evidence of infestation by woodborers and/or ambrosia beetles; 3) Among the fire-injured trees that died, trees of thin-barked species that are particularly susceptible to fire damage suffered disproportionately [Pacific yew died in 100% of the sample, followed by western hemlock (72%), white fir (65%), western redcedar (46%), then Douglas-fir (7%)]; and 4) There has so far been little evidence of activity by the more aggressive scolytid bark beetles.

It is very possible that a high proportion of all of the fire-killed trees would eventually be colonized by woodborers and this would likely lead to substantial degrade of wood. It is also likely that more of the currently-live fire-injured trees would succumb to borer attacks during the next few years. However, the insects that have so far been observed infesting trees within the fire area are all species that are adapted to breed in already dead or very severely weakened trees. Unless populations of the more aggressive tree-killing scolytid bark beetle species, especially Douglas-fit beetle and/or mountain pine beetle, develop in future years, it seems unlikely that significant numbers of healthy, vigorous trees either inside or outside of the fire perimeter would be infested and killed. It is possible that this would happen in the next four years. Additional monitoring would be needed to determine if scolytid bark beetle activity in fact becomes significant.

Indirect Effects:

Forest age class, composition, structure, and pattern may change within the Apple fire area depending on the level of mortality caused by beetles over the next five year period. Late-successional habitat could be replaced by early-successional habitat dominated by high snag levels and pioneer tree, shrub, fern, and herb species, both at the small and large scale.

Cumulative Effects:

Predicting beetle population build-ups associated with the Apple Fire is impossible to do with precision; however, some probabilities can be suggested. There is a very high probability that there would be beetle population build-ups within the burn perimeter on fire-injured trees. Additional infestation of fire-injured trees and possibly of uninjured trees within the perimeter would be expected under all alternatives.

There is a *possibility* that population build-ups would be sufficiently great to result in insect activity on hosts outside of the Apple fire area, especially within 2 miles of the fire perimeter. However, it is impossible to say definitively whether this would or would not happen. Build-up of bark beetle populations and significant infestation of surrounding trees has occurred in association with some fires in Oregon. When this has happened, it has almost always involved a fire that burned at a time when bark beetle populations were already elevated in and around the fire area at the time that the fire started. Though Douglas-fir beetle populations were relatively high up until a year ago in the fire area, populations had subsided by the time that the Apple fire actually ignited. If population build-ups are sufficient to result in beetle activity in stands surrounding the Apple Fire area, it is most likely to involve Douglas-fir beetle. There is also a lesser possibility of pine bark beetle population increase. Build-ups of other beetle species on other hosts are not likely.

The only really accurate way to evaluate bark beetle/woodborer populations and their impacts associated with a fire is through careful, well-planned monitoring after the burn. The North Umpqua and Diamond Lake Ranger Districts, in cooperation with the Southwest Oregon Forest Insect and Disease Service Center, will continue to monitor actual occurrence of insect activity within the Apple fire perimeter. This will continue to be done using a combination of permanent plots, periodic field visits keyed to periods when infestation by various insect species is most likely to occur, and aerial surveys.

DETERIORATION OF FIRE KILLED TREES

Affected Environment

Merchantable wood in trees killed by fires deteriorates fairly rapidly. The major agents involved in degrading and decaying wood are wood boring insects and wood decay fungi. In addition to degrading wood directly as they tunnel through wood, woodborers and sometimes bark beetles are also the vectors responsible for introducing most decay fungi into and spreading them through dead trees. Sap staining fungi (such as blue stain organisms) are introduced into trees at the time of death or shortly thereafter. Sapwood and heartwood decay fungi can be introduced at any time that insects are actively penetrating the bark or that windborne fungal spores are deposited on suitable infection courts.

Dave Schultz, a Forest Service entomologist, summarized the most comprehensive study of deterioration rates he could find (Kimmey 1955, Schultz 1994). The summary lists the following conditions as affecting decay rates:

- Tree species - Douglas-fir decays slower than others;
- Tree size - large diameter decays more slowly;
- Percent sapwood - sapwood decays quickly;

- Growth rate - greater rings per inch decays more slowly;
- Climate - cold (<41 degrees) slows decay;
- Elevation - high (no range given) has slower decay rates;
- Aspect - north slope timber decays more slowly.

Environmental Effects

Direct and Indirect Effects:

Wood boring insects and wood decaying fungi would rapidly deteriorate the sapwood. Heartwood is affected at a later time and tends to deteriorate more slowly.

For the planning area, wood in the true firs and hemlocks is predicted to deteriorate most rapidly, while sugar pine would deteriorate at an intermediate rate. The wood in Douglas-firs and cedars would deteriorate most slowly.

For the conifers in the planning area, the smaller/younger trees are expected to deteriorate more rapidly than larger/older trees. Large, old trees with high proportions of heartwood would remain sound much longer than young trees with larger proportions of sapwood. Trees that were experiencing slow growth rates (narrow growth rings) prior to being killed by the fire are expected to deteriorate more slowly than those that had fast growth rates (trees with wide growth rings).

Cumulative Effects:

A number of studies have been done on rates of deterioration of fire-killed conifers in the western United States (Kimmey and Furniss 1943, Kimmey 1955, Lowell et al. 1992, Hadfield and Magelssen 2000). Results of these studies differ in detail but all show that the amount of deterioration in fire-killed trees, even after just a few years, is quite rapid within the first 5 years. For example Douglas-fir, a tree species that is relatively resistant to degrade and decay, it is reported that 4 to 22 percent of the wood volume in dead trees deteriorates in the first year after a fire (Sessions et. al. 2003) and 24 to 72 percent deteriorates in the first 5 years (Table 39). For white fir, a tree species that is prone to rapid degrade and decay, it is reported that 12 to 25 percent of the wood volume deteriorates in the first year after the fire and 93 to 100 percent deteriorates in the first 5 years. These deterioration rates can be considered worst-case as many of the conditions tied to slower decay are present in the sale area. The numbers for each year are percent sound board- foot volume remaining.

Table 39. Douglas-fir Percent Sound Board Foot Volume

DBH	2003	2004	2005
12	82	35	30
20	85	45	44
30	89	57	56
40	92	66	64
50	93	73	72

Lowell and Cahill (1996) found significantly less volume loss in a study of fire-killed timber in Northern California and Southern Oregon coastal forests. They reported average

volume loss of less than 10% in the second year for all species (Lowell and Cahill 1996). Neither study described the time of year their data were taken.

For analysis purposes, the rates given in Table 39 are assumed to be as of the fall of each year, after the hot, dry season. The assumption is that if the timber is logged before the fall of 2004, minor volume loss would be experienced.

VEGETATIVE REGROWTH AND FOREST SUCCESSION

Affected Environment

The affected environment for forest vegetation encompasses the areas of proposed harvest, reforestation, and slash treatment within the Baked Apple Planning Area under six alternative scenarios. Most of these areas were subject to high intensity/moderate severity fire in 2002 and have very few live conifer trees left within them. In general, mature/old growth Douglas-fir had the highest level of survival within these areas. The affected environment includes both riparian and upland habitats. The maintenance and restoration of species composition and structural diversity of plant communities in riparian areas is part of ACS objective 8 (USDA/USDI 1994).

The dry western hemlock and Douglas-fir forest zones dominate the upland and riparian habitats associated with Class 3 and 4 streams. The moist western hemlock zone is most common in riparian habitats associated with Class 1 and 2 streams. Forest structure before the Apple fire varied between the stand initiation (early-seral), stem exclusion (mid-seral), understory re-initiation (late-seral), and old growth (late-seral) forest stages, as defined by Oliver and Larsen (1996). After high intensity fire, these areas have been returned to the stand initiation (early seral) structural stage.

The Douglas-fir zone occurs on the upper slopes and ridges usually with steep gradients and southerly aspects. Douglas-fir dominates the zone and common associates are incense-cedar, sugar pine, madrone, and chinquapin. Soils are generally shallow and rocky with low moisture availability. This zone is characterized by low to moderate site productivity. Because of harsher growing conditions, these areas are slow to revegetate after fire (USDA 2001).

The dry western hemlock zone is the most common within the affected environment and has the highest plant diversity. Douglas-fir dominates the zone and common associates are western hemlock, incense-cedar, sugar pine, western redcedar, white fir, madrone, bigleaf maple, vine maple, rhododendron, dogwood, and chinquapin. This zone is characterized by low to moderate site productivity.

The moist western hemlock zone encompasses the moister, low elevation environments and is strongly associated with the Class 1 and 2 riparian habitats within the affected environment. The zone is characterized by gentle slopes, northerly aspects, and high site productivity. The major tree species include Douglas-fir, western hemlock, western redcedar, bigleaf maple, and red alder. The shrub and herbaceous layers are diverse and consist of vine maple, willow, dogwood, rushes, sedges, and grasses.

The overall goal for land management in the Middle North Umpqua watershed is to move it towards the desired condition of a healthy, productive forest that provides a range of forest commodities on a long-term, sustainable basis (USDA 2001). Within the Matrix, the emphasis is to provide a predictable and sustainable level of timber into the future using a scientifically sound and ecologically credible plan (USDA 2001). Two basic components

establish the foundation for the management goal as described above. The first component is to re-establish landscape patterns, which are associated with the local natural disturbance regime. The second component is to manage stand structure and species diversity to fit the potential of the land. If this is done, the watershed will contain a broad range of forest types, structures and patterns indicative of its fire regime.

At the landscape-scale, the forest will maintain the same general balance of patterns and structures through time but individual stands will be changing continuously. This shifting mosaic of forest patterns and structures should maintain healthy, timber-producing stands, contribute to the diversity of plant communities and wildlife habitats, and maintain biodiversity across the landscape by providing the appropriate mix of habitats needed by indigenous fish, botanical and wildlife species (USDA 2001).

The highest intensity fire was located in the Panther Creek subwatershed, particularly within the Limpy Creek subdrainage. This high intensity fire created a contiguous stand replacement event approximately 4,000 acres in size. This type of fire event was not atypical of the steep, dry dissected topography within the Limpy creek subdrainage. The watershed analysis states “The percentage of high-intensity fires over the last 150 years has been approximately 49% of the area, as opposed to 25% within adjacent watersheds.” Before the Apple Fire of 2002 occurred, the watershed analysis recommended using management tools to approximate large scale stand replacement fire in the Bachelor/Limpy Creek area through even aged silvicultural systems with rotations of 80-120 years.

Environmental Effects

The USDA Forest Service’s Fire Effects Information System (FEIS), Forest Vegetation Simulator (FVS), scientific publications, 2003 Baked Apple stand exam information, field reconnaissance, Spring Fire stocking surveys from year 2000, communication with a journey level botanist and soil scientist, and professional judgment are used to evaluate the effects of the alternatives on vegetative regrowth and forest succession within the affected environment. Both natural processes and management actions are considered in the analysis. Natural processes include regeneration through seeding, adventitious-bud root crown/root sucker, surviving caudexes (stem), and surviving rhizomes. Management actions include planting, mulching, animal damage control, shade protection, slash treatment, and harvest.

Capable, available, and suitable²⁹ lands for timber production must meet the five-year regeneration requirement under the National Forest Management Act (NFMA) regulations at 36 CFR 219.27(c)(3). In most cases, reforestation through planting is necessary to meet this regulation due to the lack of a conifer seed source in harvest units that experienced high intensity fire.

²⁹ Capable lands are those productive forest lands, not identified as reserved or deferred, that are capable of producing commercial timber harvests. Available lands are those lands that have not been administratively or legislatively withdrawn from timber production. Suitable lands are lands that are to be managed for timber production on a regulated basis.

Direct Effects:

Hardwoods, Shrubs, Herbs, Ferns

Natural regeneration of post fire pioneer species is presently occurring throughout the affected environment, under all alternatives. The quantity and quality of growth is positively correlated with the amount of light and moisture available to the pioneer species. Major native species in the upland habitats include madrone, chinquapin, bigleaf maple, *Ceanothus* sp., bracken fern, manzanita, vine maple, poison-oak, blackberries, thimbleberry, red raspberry, elderberry, rose, oceanspray, *Ribes* sp., fireweed, and rhododendron. Major native species in the riparian habitats include bigleaf maple, vine maple, willow, dogwood, California hazel, thimbleberry, fireweed, bitter cherry, spikenard, oceanspray, popcorn flower, tiger lily, goatsbeard, serviceberry, *Ribes* sp., elderberry, lady and maidenhair fern, and grasses. Red alder and Pacific yew are not regenerating, probably due to fire severity.

Vegetative regrowth would be stalled for two to three years in areas targeted for harvest and subsequent prescribed burning under Alternatives 2-6. Natural regeneration processes similar to the present post-fire vegetative regrowth would begin again within a year after burning operations that are designed to meet effective ground cover standards and maintain large woody material on site.

Pioneer non-conifer species would persist in the understory for 35 to 50 years in areas targeted for conifer reforestation, depending on site productivity. Modeling performed in the Forest Vegetation Simulator predicts greater than 60% canopy closures at 40 to 50 years. Pioneer species may persist up to 100 years in areas not targeted for reforestation and not within close proximity of an adequate conifer seed source. Unsuitable soil areas centered in the high intensity fire landscape fit these criteria. These areas could remain early-successional shrub habitat for a long period of time and function as unique wildlife habitat.

Conifers

If high intensity fires are extensive, a conifer seed source may be limited due to lack of seed trees. Under these circumstances, seeds come from mature trees which survive fire, survivors in small unburned pockets, or from trees adjacent to the burned area. Where seed trees are scarce, it may take 50 to 100 years or more for Douglas-fir to restock the burned area (Spies and Franklin 1988; Sessions et. al. 2003). Microsites with adverse moisture and temperature conditions frequently limit establishment of Douglas-fir seedlings on southerly aspects (Hermann and Chilcote 1965). Prolonged droughts, which may extend from May through September, are frequent in southern Oregon. On drier sites, regeneration may be quite protracted and require a hundred years or more. This could be the case on steep, dry south and west aspects located in the large block of stand replacement under Alternative 1 and where no harvest or reforestation is proposed under Alternatives 3, 5, and 6. Broad age ranges may occur naturally on these poor, dry sites. Few stems initiate each year, but new stems can continue to initiate for many years where seed sources are distant or herbaceous or shrub competition is prevalent (Oliver and Larson 1996). This reforestation delay would not move the planning area towards the desired condition of a healthy, productive forest.

Natural regeneration of pioneer conifer species (Douglas-fir, sugar pine, incense-cedar, western redcedar) is occurring within close proximity of live conifer seed trees. In

general, this is around the perimeter of the high intensity post-fire landscape or near small pockets of green trees. After the Tillamook Fire in northwestern Oregon, seedlings were restricted to areas around scattered survivors or near the burn edge (Wright and Bailey 1982). Stocking surveys conducted four years after the Spring Fire of 1996 confirm this phenomenon. The Spring Fire, located across the North Umpqua River from the Apple Fire, was similar to the Apple fire in that approximately 40% of the area received a high intensity fire in a large contiguous block. After four years, 62% of the stand replaced area (which was not salvaged) was not stocked to the minimum stocking level of 125 trees per acre required under current regulations for capable and available lands, and 30% had no conifer regeneration. Most of this area was not in close proximity of seed trees. Vegetative cover, in the form of grass, shrubs, and herbs, averaged 72%.

The Beschta report entitled “Wildfire and Salvage Logging” states that if native species are failing to reestablish naturally, that failure will frequently be associated with other reasons than the absence of seed sources. There is little scientific literature that supports this statement (Evers 2002).

Native conifer species tailored to the site conditions would be established through natural regeneration and planting within capable and available lands proposed for harvest and/or fuels treatment in all action alternatives. This will maintain species diversity to fit the potential of the land. Total harvest acres planted by alternative are depicted in Table 40. Riparian reserves that received high intensity fire would also be established through native conifer planting, except under Alternatives 1 and 5. Approximately 600 acres of riparian reserves would be planted under Alternatives 2, 3, 4, and 6. Thirty to forty percent mortality is expected, due to post-fire site conditions. Planting densities are designed to avoid pre-commercial thinning in the future. Planting would accelerate forest succession in the large contiguous block of stand replacement, possibly by 30 to 100 years and move the Baked Apple Planning Area and Middle North Umpqua Watershed towards the desired future condition.

The extent of understory damage and subsequent mortality associated with logging and slash treatment is directly related to the amount of volume removed, logging system, and slash treatment method. It is estimated that less than 20 percent of the natural regeneration present in green stands would be damaged or killed, due to low volume removal, piling instead of underburning, and the helicopter, skyline, and loader logging systems proposed for harvest.

Table 40. Total harvest acres planted and percent of harvest planted by alternative

ALTERNATIVE	ACRES PLANTED/PERCENT OF HARVEST PLANTED	ACRES OF RIPARIAN RESERVES PLANTED
1	0	0
2	957 (89%)	600
3	770 (87%)	600
4	951 (64%)	600
5	220 (51%)	0
6	873 (94%)	600

ACS objective 8 focuses on the maintenance and restoration of species composition and structural diversity of plant communities in riparian areas to provide for a variety of ecologic benefits. The reforestation of riparian reserves under Alternatives 2, 3, 4, and 6

would accelerate the reforestation of about 600 acres of intensely burned riparian reserves by as much as 100 years. These alternatives would contribute to the over-all goal established by ACS objective 8 more than Alternative 1 and 5. Alternatives 1 and 5 would not accelerate the successional process; natural regeneration would occur, but at a slower rate.

Indirect Effects:

Vegetative regrowth and forest succession within the affected environment affects many other resources and ecological processes within the Baked Apple Planning Area in the short and long term. These include hydrology, soils, wildlife, fire/fuels, fisheries, economics, recreation, erosion and sediment, and fire risk. These effects are discussed throughout this chapter, under the appropriate resource heading.

Cumulative Effects:

Other activities have taken place in the recent past or are planned to take place in the foreseeable future that add to the vegetative regrowth and forest succession process within the Baked Apple Planning Area. Past activities include native conifer plantings within 286 acres of burned plantations and 50 acres of the Limpy Creek riparian zone, 20 acres of blue wild rye seeding to control meadow knapweed along road systems, and 3 acres of fescue planting and blue wild rye seeding within rehabilitated fire safety zones used during the Apple Fire. Planned activities include 1600 acres of native conifer plantings within burned plantations in 2004 and 2005, and 120 acres of reforestation associated with the Apple Seed Timber Sale in 2004.

These management activities coupled with the native conifer plantings proposed in Alternatives 2-6 would accelerate the vegetative regrowth and forest succession process and move the Baked Apple Planning Area towards the desired condition of a healthy, productive forest that provides a range of forest commodities on a long-term, sustainable basis. Table 41 outlines the cumulative number of acres where management activities have or would likely take place over the next 3 years by alternative. The number in parentheses is the percent area of management activity within the high intensity fire zone, inside the Baked Apple Planning Area. The high intensity fire zone within the planning area encompasses about 4,000 acres.

Table 41. Total acres of management activities that would lead to vegetative regrowth and forest succession, with percent of activities that are within the high intensity burn area.

ALTERNATIVE	ACRES/PERCENT OF AREA WITH VEGETATIVE REGROWTH MANAGEMENT ACTIVITY
1	2,049 (51%)
2	3,617 (89%)
3	3,385 (84%)
4	3,612 (89%)
5	2,269 (56%)
6	3,494 (86%)

AQUATIC ENVIRONMENT

THE NORTH UMPQUA RIVER

The Umpqua River basin extends well inland into the Cascade Range, and it is one of the largest coastal river basins in Oregon. Panther Creek, the 6th field sub-watershed that is the focus of this analysis, is a tributary to the North Umpqua River. The North Umpqua River is noted for its cold water that originates from aquifers³⁰ in the High Cascade Mountains. This is especially true, where the North Umpqua flows through the Umpqua National Forest. The cool waters of the North Umpqua provide good conditions for all life stages of cold water fish species, such as salmon and trout. Though many tributaries to the North Umpqua River become warm and their flows recede in the summer, the river itself provides a cool refuge for juvenile fish. Many juvenile steelhead, for instance, leave their natal tributaries in mid-summer to rear in the North Umpqua River, because the river provides large quantities of cold water not found in tributaries (Fontaine 1988; Dambacher 1991).

Most tributaries of the North Umpqua, that have historically been important for anadromous fish and water quality contribution, are in degraded condition because of riparian timber harvest, road construction, large woody debris removal, and changes to sediment supply and channel morphology (USDA 2001). Mainstem reaches of the lower North Umpqua River, the Umpqua River, and estuary have also undergone changes that may have reduced habitat suitability for native fish, such as increased water temperatures, the introduction of non-native predaceous fish, urban development, water withdrawals, pollution and impacts associated with logging and agricultural development.

A 34-mile section of the North Umpqua River was designated as a recreational river under the National Wild and Scenic Rivers Act in 1988. The Wild and Scenic River begins at Rock Creek, east of Glide, Oregon at river mile 36 and extends to Soda Springs dam at river mile 70. Panther Creek flows into the North Umpqua Wild and Scenic River at river mile 58, about two-thirds through the designated reach. As defined by the Act, a National Wild and Scenic River must be undammed and must have at least one outstandingly remarkable value (ORV). The established ORVs for the North Umpqua Wild and Scenic River are: fisheries, water quality and quantity, recreation, scenic, and cultural. The underlying principles of the Act are to keep the designated River in a free flowing condition and to recognize the River's importance to our natural and cultural heritage (USDA et. al. 1992).

Sport fishing has long been a popular recreational activity throughout the Umpqua River basin. The North Umpqua is world-renowned as a high-quality fly fishing stream for summer steelhead, and fishing gear has been restricted to artificial flies since 1953. In addition to sport fishing, whitewater boating, sightseeing, camping, picnicking, trail use and bicycling are all major recreational uses of the river corridor. All of these activities have steadily increased over the last decade, along with the management of this growing recreational resource.

³⁰ Aquifers are sources of groundwater that in this area, are a result of very deep deposits of porous ash laid down during the eruptions of Mt. Mazama (now Crater Lake). Cold ground water held in these aquifers feed the headwaters of the North Umpqua and result in high quality, cold water many miles downstream.

Key watersheds, established in the Northwest Forest Plan, in the vicinity of Panther Creek that flow into the North Umpqua River are: Williams Creek, 6.5 miles downstream of Panther; Steamboat Creek, 4.6 miles downstream of Panther Creek; Calf Creek, 4.2 miles upstream of Panther Creek; and Copeland Creek, 9 miles upstream of Panther. These key watersheds provide spawning and rearing refuge areas, to varying degrees, for the five species of anadromous fish within the North Umpqua: chinook and coho salmon, steelhead, coastal cutthroat trout, and Pacific lamprey. The mainstem North Umpqua River is used for spawning primarily by spring chinook salmon and winter steelhead. Tributary streams are used for spawning primarily by summer steelhead, coastal cutthroat trout, coho salmon, and Pacific lamprey. The mainstem North Umpqua is an important rearing area for juveniles of all native species.

The Middle North Umpqua Watershed Analysis (USDA 2001) identified much of the area now in the Baked Apple planning area as naturally prone to stand-replacement fire due to the very steep, dissected topography, abundance of dry southerly facing slopes, and the influence of the North Umpqua River canyon that often funnels east winds down the canyon in the summer. Due to inherently steep stream gradients and hillslopes and the fire disturbance regime in this area, the Panther sub-watershed is not well suited as a refuge for anadromous fish species. Indeed, the Panther basin was not identified as a key watershed in the Northwest Forest Plan.

While significant disturbance events such as the 2002 Apple Fire can cause substantial short-term impacts to aquatic ecosystems, these disturbances provide important inputs to the aquatic system that are needed by fish and other aquatic organisms (wood, rock, and nutrients). When water temperatures, peak flows, or debris flows kill fish and other aquatic life or force them downstream after a fire, populations of their species are retained in locations where conditions are not as impacted. Recolonization from these "source" habitats back into recovering habitats is how anadromous species have survived disturbances over the centuries. The North Umpqua River and the key watersheds listed above provide those source habitats.

This aquatic analysis is primarily focused on the Panther Creek 6th field sub-watershed, which is part of the much larger 123,914 acre Middle North Umpqua 5th Field watershed. Most of the effects of the fire and of the proposed salvage activities are expected to occur at the scale of the Panther Creek sub-watershed with generally lesser impacts to aquatic conditions expected downstream in the North Umpqua River. The Middle North Umpqua 5th field watershed is composed of a series of smaller sub-watersheds that each flow, separately from one another, as face drainages into the North Umpqua River. Therefore, the only downstream effects within this particular 5th field watershed would be within the North Umpqua River itself.

The additive effects of the 2002 fires that burned in the North and South Umpqua watersheds and the proposed salvage projects in both watersheds are not likely to result in any measurable effects downstream in the main Umpqua River. Both fires burned in the headwaters of the North and South Umpqua, many miles upstream from the main Umpqua River where additive effects could be realized.

BENEFICIAL USES OF WATER

To meet the Clean Water Act and Standards and Guidelines in the Umpqua National Forest Plan (LRMP, IV-64), the beneficial uses of downstream waters must be identified and management activities planned so they will not interfere with or be injurious to the beneficial uses of downstream waters. Many of the beneficial uses are described above. The complete list of the beneficial uses of the North Umpqua River and its tributaries includes: 1) public and private domestic water supply; 2) industrial water supply; 3) irrigation; 4) livestock watering; 5) anadromous fish passage, spawning and rearing; 6) resident fish and aquatic life; 7) wildlife and hunting; 8) fishing; 9) boating; 10) water contact recreation; 11) aesthetic quality; and 12) hydropower. Within the Panther Creek sub-watershed, the beneficial uses are: 1) anadromous fish passage, spawning and rearing; 2) resident fish and aquatic life; 3) wildlife and hunting; and 4) aesthetic quality.

Scoping identified increased sediment delivery as a potential risk to beneficial uses within planning area waters and downstream areas including the Wild and Scenic North Umpqua River. This significant issue is tracked in this chapter under the title of erosion and sedimentation.

WATER QUALITY

The management of water quality is addressed in the Northwest Forest Plan under Aquatic Conservation Strategy objective 4, which calls for the maintenance and restoration of water quality necessary to support healthy riparian and aquatic ecosystems. NOAA Fisheries (the regulatory agency responsible for implementing endangered species requirements for ocean-going fish) uses water quality as one of many assessment factors in the conferencing process for fish species with the potential for listing under the Endangered Species Act (ESA). Three water quality indicators are assessed during conferencing: temperature, chemical contamination/ nutrients, and sediment and turbidity. A complete list of the NOAA Fisheries assessment factors is found in Table 59 at the end of this chapter. Temperature and chemical contamination/nutrients are addressed in this section while sediment is addressed later in this chapter. Temperature and chemical constituents are largely influenced by the loss of riparian vegetation, which typically leads to declines in these water quality indicators.

STREAM TEMPERATURE

Affected Environment

The NOAA Fisheries indicator for water temperature used during conferencing is considered 'not properly functioning'³¹ because maximum temperatures in the basin exceed those established as water quality standards. The Clean Water Act requires that each state identify waters that are exceeding the state's water quality standards. Based on water quality standards, the seven day moving average of the daily maximum temperature shall not exceed 64°F (17.8°C) for the protection of salmonid³² and resident

³¹ Not properly functioning refers to riparian/stream/wetland ecosystems that clearly do not possess characteristics that allow it to function as it normally would if intact.

³² Salmonids belong to the family of fish that include salmon and trout. Some species are sea-going (anadromous) while others are not (resident).

fisheries during the summer rearing period. The seven-day moving average is defined as the average maximum temperature over seven consecutive days. Although pre-fire stream temperatures were typically within a range acceptable for salmonid spawning and rearing, Panther Creek was listed by the state as water quality limited due to exceeding the 64°F standard.

The removal of streamside vegetation during timber harvesting was a common practice throughout the Panther Creek drainage from initial entry into the watershed in the 1950's through the 1990's. Some significant riparian harvest along perennial streams resulted in periods of increased stream temperatures. Low summer base flow typical of the Western Cascades also plays a role in the high summer temperatures of this sub-watershed.

The mouth of Panther Creek has been monitored during the summer months since 1996 prior to the 2002 Apple Fire. Prior to the fire, the highest recorded temperature was 71.1°F in 1996. Tributaries in the Panther Creek sub-watershed were monitored from 1999 to 2001 (Table 42). The maximum seven-day moving average at the mouth of Panther Creek was 68.8°F during the summer of 2002 after the fire, which is the highest seven-day average recorded in the last four years. It is likely that the unmeasured tributary temperatures were also elevated as a result of the fire.

Table 42. Stream Temperature Data (in degrees Fahrenheit) during the warmest 7-Day Periods of 1999-2001. The values shown are not directly comparable due to climatic variation between years.

Tributary Name	1999 7-day Max Temp	1999 Daily Change (Δ°F)	2000 7-day Max Temp	2000 Daily Change (Δ°F)	2001 7-day Max Temp	2001 Daily Change (Δ°F)
Bachelor Creek at Mouth	62.7	2.3	63.3	3.8	64.1	3.2
Fairy Creek at Mouth	63.4	3.3	63.7	4.2	64.7*	3.9*
Limpy above Bachelor	63.1	2.9	---	---	62.4	3.1
Limpy above Panther	ND	ND	68.1	7.4	---	---
Panther above Limpy	63.9	4.4	---	---	---	---
Panther Creek at Mouth	64.7	4.0	67.2	6.5	67.4	4.9

* Data suspect as thermograph may have been above water during lowest flow.

Δ°F symbolizes change in degrees Fahrenheit.

ND-no data

Large daily temperature fluctuations prior to the 2002 fire are indicative of increased solar radiation reaching the stream due to past riparian timber harvest, and/or channel

widening. Panther Creek at the mouth had the highest daily fluctuations prior to the 2002 fire.

Following the fire, stream temperature increases are expected to be proportional to the amount of riparian stand replacement fire (Table 43). Sixty-six percent of the riparian reserve in Limpy Creek was burned during the fire of 2002. Significant temperature increases are expected within this drainage. On July 29, 2003, afternoon water temperatures were recorded as follows: mouth of Panther Creek, 72°F; mouth of Limpy Creek, 74°F; mouth of Fairy Creek, 72.5 °F, mouth of Bachelor Creek, 68°F; and Limpy Creek above the confluence with Fairy Creek, 76°F. Air temperatures that day peaked at the riparian sample sites at 104°F at 1:30 in the afternoon.

Table 43. Riparian Reserve Conditions, Past and Present.

7th field Drainage	Estimated Range of Natural Variability of Early Seral Vegetation in Riparian Stands*	RR Stand Replacing Fire in 2002	Previously Harvested Perennial RR
Bachelor	1-29%	33%	43%
Fairy	1%	26%	41%
Limpy	0-29%	66%	30%
Panther	5-18%	9%	42%
South Apple Facial	1-20%	22%	8%

*Interpreted from historic aerial photographs representing a time frame from the late 1800's to 1946. The riparian stands within the planning area that were interpreted as being mid-seral in 1946 were early seral in the late 1800's representing the high end of the range. The riparian stands mapped as early-seral in 1946 represent the low end of the range.

Stream temperatures in the Bachelor and Fairy drainages, which experienced less stand-replacing fire, will also increase but to a lesser degree. Exposure to solar radiation may worsen over the next few years as additional green trees die due to the latent effects of ground fires that burned portions of tree crowns and tree boles. In addition, activities associated with the fire suppression such as hazard tree removal and felling of trees adjacent to channels may have impacted riparian canopy cover, but effects are negligible and undetectable at this scale.

Dead late-seral tree boles will provide shade for streams. Post-fire stand examinations within riparian areas revealed an average of 60% to 68% canopy closure the first few months following the fire. A study following the 1987 Silver Fire on the Siskiyou National Forest revealed that dead trees provided 57% of the post fire shade along streams that had been intensely burned. Increased summer flows and inputs of cool ground water following the Silver Fire helped to lessen water temperatures downstream of the intensely

burned watersheds (Amaranthus et al. 1989). These conditions were due to the fact that burned watersheds discharge more water because dead trees do not use water; the unused water is discharged into streams.

Low flow measured 2.2 cubic feet per second (cfs) at the mouth of Panther Creek, compared to 810 cfs in the North Umpqua above Steamboat a few miles downstream in August 2000. Panther Creek contributes only approximately 0.3% of the flow of the North Umpqua River at this location, thus temperature increases due to the fire of 2002 would be undetectable within the North Umpqua River.

The planting of the burned riparian area along Limpy Creek during February of 2003, will help to substantially speed the recovery of shade compared to the rate of natural reforestation. The addition of large wood to both Limpy and Bachelor Creeks, with more recruitment on the way, will accumulate gravel within the stream channel leading ultimately to more intragravel stream flows compared to the more exposed flow over bedrock that occurred in many locations before wood additions. This may help lower stream temperatures once more stream substrate accumulates over time.

The canopy removal due to historic timber harvest and the 2002 wildfire have increased water temperatures within the Panther Creek sub-watershed. Currently the stream temperature within the Panther sub-watershed is on the high end of the natural range of variability as a result of the 2002 fire. However, the chronic temperature elevation due to riparian timber harvest spanning four decades is probably outside the range of natural variability. The chronically elevated stream heating from riparian timber harvest over several decades has likely added increased stress on generations of aquatic organisms over a much longer period than periodic stand replacement events would have done alone. Based on criteria used by NOAA Fisheries for conferencing on fish species that may become federally listed, the temperature regime of the planning area is classified as 'not properly functioning' because rearing temperatures exceed 65°F.

An early study in the nearby Steamboat Creek watershed on the Umpqua National Forest found that solar radiation was the primary cause of summertime water temperature increases when streamside vegetation was removed (Brown 1969). Vegetation plays a vital role in reducing solar radiation reaching the stream. The width of the riparian vegetation providing effective shade is a function of vegetation height, with shorter trees providing a narrower shade zone than taller trees. Riparian vegetation providing shade is a function of slope, which together with vegetation height can be used to predict the width of the riparian area providing shade (Figure 57). For example, given 120 foot tall trees on a 50% slope, the width of the stream shading riparian area is 108 feet from the edge of the stream (Park 2003). The average hill slope gradient in the planning areas is represented by 50% for the purposes of this analysis.

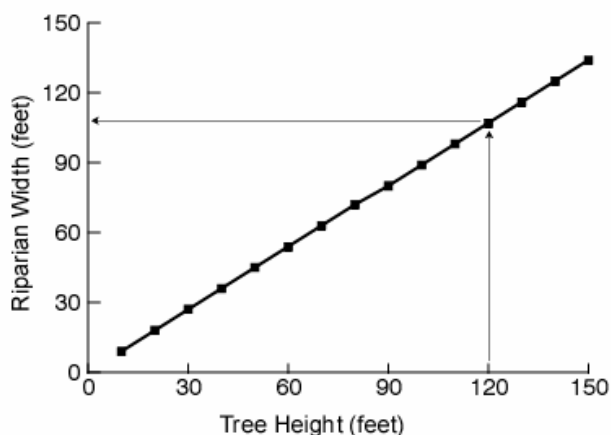


Figure 57. Riparian width contributing shade based on tree height and 50% hillslope (from Park 2003).

In the Baked Apple planning area the period of greatest solar radiation occurs between 10:00am and 2:00pm during the hottest portion of the year. During this four hour period, almost 60% of the total daily solar radiation is available (Park 2003). Thus, vegetation that intercepts solar radiation during this time period is critical in producing stream shade and reducing stream temperature. The primary shade trees, or trees that shade the stream between 10:00 a.m. and 2:00 p.m., become the most important factor when determining effective shade (Figure 58). Primary shade trees provide shade throughout the day while secondary shade trees contribute to riparian shading only when the sun is lower in the sky.

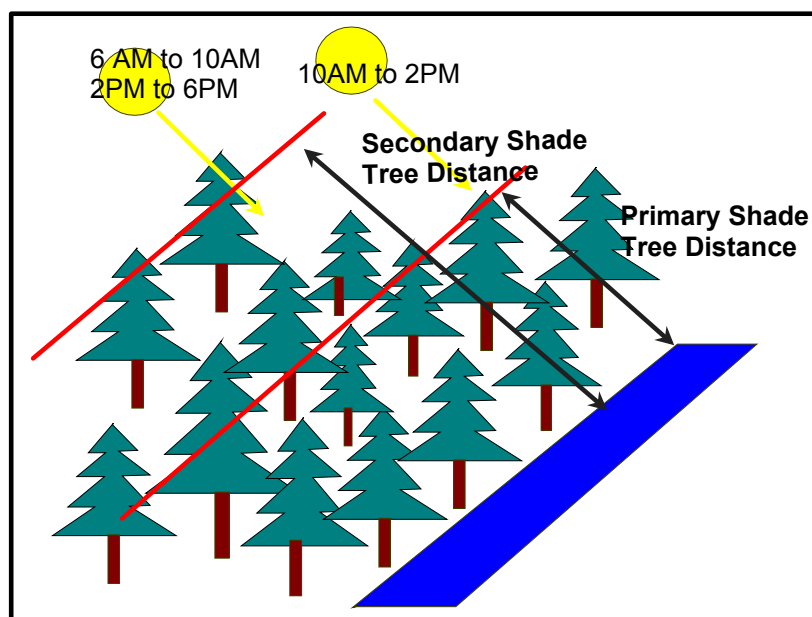


Figure 58. The effective shade zone is composed of primary and secondary shade trees.

Environmental Effects on Stream Temperature

Direct Effects

Only Alternative 4 proposes reducing fuel hazard by felling trees within the riparian reserve adjacent to some of the harvest units. On class I and II streams³³ the outer 180 feet of riparian buffer (of the total 360 foot buffer on each side) would have trees up to 18 inches cut, totaling 32 acres. Removal of these dead trees outside the effective shade zone would not reduce shade reaching streams as the trees are not currently providing any shade to the creek (Table 44). Ambient air temperature influences from removing dead trees from outside the primary shade zone would have no affect on the resulting stream temperatures.

Table 44. Effective Shade Distances for Tree Diameter Classes Slated for Riparian Treatment Under Alternative 4.

Tree Diameter Class (inches)	Tree Height (feet)	Effective Shade Distance	
		Primary Shade Distance (feet)	Secondary Shade Distance (feet)
8	40-50	0-25	25-45
12	45-90	0-40	40-80
18	75-110	0-50	50-90

Under Alternative 4, the floodplain (or the inner 75 feet, whichever is greater) would be left untreated on class I and II streams, while the remaining portion of the inner 180 foot buffer would have trees in the 8 to 12 inch diameter class cut, leaving a minimum of 34 trees per acre in those diameter classes. Trees less than 8 inches in diameter would be felled, the slash hand piled and burned while larger trees would be untouched. A 12-inch diameter class tree may provide shade for up to 80 feet. Only 5 feet within the secondary shade zone would have dead trees harvested under Alternative 4, totaling only two acres across the entire planning area. All trees larger than 12 inches would remain standing, and no trees would be removed within the primary shade zone. Therefore, stream shade reduction (Table 45) along class I and II streams under Alternative 4 would be immeasurable and stream temperature increases would be negligible at this scale.

Under Alternative 4, class III streams would have a 50 foot no-cut buffer with the outer 130 feet of the buffer width having a minimum of 34 trees per acre in the 8-12 inch diameter class remaining. The effective shade distance for a 12 inch tree is 80-feet (Table 44); therefore, a buffer approximately 30 feet wide would have some dead trees removed from the outside edge of the secondary shade zone that could provide some small amount of shade from dead tree boles. However, canopy closures are modeled to be reduced by only 3% as all larger trees would remain standing on the 15 acres that fall into the secondary shade zone. There would be no measurable direct effect on stream temperature in the class III streams under Alternative 4. The primary shade zone, which provides most of the shade, would not be directly affected by Alternative 4.

³³ Class I and II streams are perennial streams that have sea-run (anadromous) and resident fish, respectively.

Table 45. Alternative 4 Fuels Treatment within the Riparian Reserves of Class III Streams.

Drainage	Alternative 4 Class III Riparian Fuels Treatment		
	Proposed (acres)	Within Primary Shade Zone (acres)	Within Secondary Shade Zone (acres)
Bachelor	43	0	1
Fairy	20	0	3
Limpy	171	0	11
Panther	0	0	0
Lower Apple Facial	0	0	0

Implementing any of the other Baked Apple Alternatives would not increase stream temperature, since no trees would be removed with Alternative 4 that would effectively provide shade, and since no trees would be removed at all from the riparian reserve of the other alternatives. Based on the above discussion, the beneficial uses of water would not be directly impacted by stream temperature increases as a result of implementing any of the alternatives.

Indirect Effects

The riparian fuels treatment under Alternative 4 provides the greatest long-term risk reduction of an indirect effect to stream shade in the future of another severe wildfire removing stream shade. Alternatives 2, 3, and 6 provide the next greatest reduction in risk of such an indirect effect as fuel within harvest units would be reduced to fuel model 11 (Table 26). Although Alternative 6 would have a small number of units with elevated fuel loadings, equating to a fuel model 12, the acres predicted to burn using the FARSITE model were nearly the same as for Alternatives 2 and 3. Alternative 6 also has fuel breaks which are predicted to decrease the risk of future fire spread. Alternative 5 would result in leaving fuel model 12 conditions within most harvest units. This alternative results in the most long-term risk of future stand replacement fire spreading into riparian areas of all the action alternatives. Alternative 1 has the greatest long-term risk of another wildfire, which could reduce stream shading and increase stream temperatures as fuel loading would remain high across the untreated landscape.

Approximately 600 acres within the riparian reserve would be replanted under Alternatives 2, 3, 4 and 6 with a beneficial indirect effect of accelerating stream shade

recovery. Riparian reserves would not be replanted under Alternatives 1 and 5 with no resulting beneficial effect (Table 40).

No indirect, downstream temperature increases are expected in the North Umpqua River as a result of implementing any Baked Apple Alternatives. Since no direct effects are anticipated on site, no indirect effects would occur further downstream in the Wild and Scenic River.

Cumulative Effects

The canopy removal due to historic timber harvest (detailed in Table 8 at the beginning of this chapter) and the 2002 wildfire, added to recent drought conditions have increased water temperatures within the Panther Creek sub-watershed. None of the action alternatives would add to these cumulative effects, however, within the Panther Creek sub-watershed since none of the alternatives has the potential of increasing stream temperatures.

Neither the 2002 wildfire nor any of the Baked Apple alternatives would measurably affect downstream water temperatures within the North Umpqua River due to the small flow contribution of Panther Creek to the main river during the summer months.

The indirect effects of the fuel loads left behind after implementation of the various alternatives could result in cumulative effects to water temperature when added to the stream heating effects of the past riparian harvest and present and reasonably foreseeable effects of the 2002 Apple Fire. If reburns occur in the next three decades, stream temperatures would not have fully recovered from the 2002 fire. The larger areas modeled to potentially burn under Alternatives 1 and 5 (Table 26) would have the greatest potential to affect cumulative water temperatures and the beneficial uses of water within the Panther sub-watershed. Alternatives 2, 3, 4, and 6 would all have a lesser and similar potential for resulting in cumulative effects to prolonging elevated water temperatures within the sub-watershed.

Conclusions

None of the alternatives would degrade the stream temperature indicator considered by NOAA Fisheries in the short-term. In the longer term, Alternatives such as 1 and 5 that leave more residual fuels may compromise the long-term goals of ACS objective 4 in terms of water temperature and the associated beneficial uses of water, if larger fires are triggered. Also in the long-term, alternatives that result in the most reforestation (Alternatives 2, 3, 4, and 6) provide the most benefit of shade recovery and achieving the long-term goals of the ACS objectives.

WATER CHEMISTRY

Affected Environment

Changes in the chemical makeup of water are an aspect of water quality that can affect aquatic organisms as well as the other beneficial uses of water. In July of 1995, the United States Geological Survey (USGS) measured water quality parameters including

nutrient levels, dissolved oxygen and pH in a survey of the North Umpqua River and its tributaries from Lake Creek near Diamond Lake to below the confluence of Little River near Glide. Monitoring sites were located along the main stem of the North Umpqua River and several major tributaries, including Panther Creek at its mouth.

Nutrients

Elevated levels of nutrients can compromise water quality. Organic and inorganic nitrogen were not detectable at the sample site at the mouth of Panther Creek during the 1995 survey (USGS 1996). Phosphorus concentrations were detected, likely due to the volcanic geology of the basin which tends to contribute this nutrient to stream waters. The environmental baseline for water chemistry used in the conferencing process by NOAA fisheries is currently considered to be 'at risk'³⁴ in Panther Creek since nutrient loads will likely increase over pre-disturbance conditions due to the fire.

Erosion from management-related landslides, roads, and historic harvesting may have increased nutrient loading above background levels. However, forest fertilization has the greatest potential of increasing stream water nitrogen concentrations over other management activities. Fertilizer was routinely used in the Panther Creek drainage to promote tree growth. In the 1980's, fertilizer was applied to 935 acres and to 836 acres during the early 1990's in the planning area. Fertilizer use was curtailed after 1993 because of water quality concerns, except for some hand applications outside riparian areas. Elevated nitrogen in the water column due to fertilization is short-lived and any increased nitrogen within the Panther Creek sub-watershed due to historic fertilization has long since dissipated. Increased nutrient loading may increase primary productivity³⁵ and affect stream chemistry; however, the low nutrient concentrations measured prior to the fire do not suggest excessive nutrient loading due to prior management.

Fire can potentially result in the addition of nutrients to streams. Fire converts nutrients previously tied up in living materials and decomposing plant materials into forms that are more susceptible to transport to the stream system. The loss of live vegetation that would utilize nutrients further increases the potential for nutrients to enter the water column. The effect of increased nutrient loading in streams following fire usually only lasts for approximately one year (Monleon et al 1997).

A severely burned site is more susceptible to erosion of soil and loss of nutrients into stream waters. Prescribed fire is designed to produce a low severity burn and the magnitude of the risks to water quality are lower than a wildfire since fuel consumption is less (Landsberg and Tiedeman 2002). In general, nitrogen losses to the stream from site preparation (burning) appear to be relatively small. A literature review of the effects of fire on watershed nitrogen responses found that most studies only show a maximum concentration increase of less than 1 mg/l after fire or after the combined effects of harvesting and fire (Beschta 1990). This amount of increase is not considered significant in terms of impacts to the aquatic environment from stream water nutrient loading.

³⁴ At risk refers to aspects of aquatic ecosystems that are still functioning but existing conditions and landscape attributes make it more susceptible to degradation.

³⁵ Primary production is the growth and production of biomass by plants.

pH and Dissolved Oxygen

Dissolved oxygen (DO) and pH values are affected by algae photosynthesis. The effects of forestry practices on algae growth may include increased solar availability from reduced riparian shade; changes in nutrient delivery; changes in the flow regime or loss of instream wood resulting in scour of streambeds. These factors potentially increase the algae population which leads to increased pH³⁶.

pH affects many chemical and biological processes in the stream. The Oregon Department of Environmental Quality has set the pH range of 6.5-8.5 as being optimum for aquatic organisms in the North Umpqua Basin. pH levels outside this range can reduce biological diversity in the stream because it stresses the physiological systems of most organisms and can reduce reproduction.

Algae metabolism can increase pH levels. The Middle North Umpqua watershed has a low to moderate buffering capacity (USGS 1996). Buffering capacity is a measure of a stream's ability to resist changes in pH. Reduction of the limited CO₂ (or bicarbonate HCO₃) in the water due to algae photosynthesis during the afternoon can increase pH significantly. Although Panther Creek sub-watershed did not exceed the state pH standard of 8.5, there were increases in afternoon pH levels in 1995 probably because of increased sunlight on the stream (Table 46).

Table 46. Summary of USGS water quality sampling from 1995 and post-fire sampling in 2003.

Site	Date	Time	Water Temp. (°C)	Dissolved Oxygen (% saturation)	pH
Panther Creek near Mouth	7/25/95	1632	19	99	8.1
	7/26/95	0800	16	95	7.8
	7/29/03	1554	22	93	8.1
North Umpqua River above Apple Creek	7/25/95	1648	17	102	8.2
	7/26/95	0705	13.5	97	7.5
	7/26/95	1135	15	103	7.9
	7/29/03	1609	18	98	8.1

The amount of dissolved oxygen in water is critical to the health of most stream dwelling animals. The combined effects of re-aeration, temperature, photosynthesis and respiration³⁷ of living organisms influence DO concentration within stream environments. Dissolved oxygen concentrations increase in surface water wherever the water flow becomes turbulent, such as in a riffle area or waterfall. This turbulence brings more water into contact with the air thus increasing the amount of atmospheric oxygen that is dissolved into the water, however the higher the stream temperature the lower the

³⁶ pH stands for the "power of Hydrogen". During plant photosynthesis Hydrogen ions are created. More plant life in a stream equates to more Hydrogen ions and higher pH levels.

³⁷ Respiration results in the use of oxygen and release of carbon dioxide and water in the course of animal metabolism.

dissolved oxygen concentrations. Oxygen is also produced during photosynthesis of plants. Respiration of fish and other aquatic animals utilize oxygen out of the water as does the decomposition of dead plants and organisms. While photosynthesis occurs only during daylight hours, respiration and decomposition also continues during the night. Therefore, streams with significant plant life can have DO levels that fluctuate greatly over a 24-hour period.

The water sampling at the Panther Creek site in 1995 met the benchmark set by Oregon Department of Environmental Quality to protect water quality during salmonid rearing and did not appear to show daily DO fluctuations. The Panther stream system has numerous steps and falls, which probably create the turbulence necessary to keep the water near saturation making any losses of DO due to increased algae levels difficult to ascertain. Post-fire pH and DO levels taken during July, 2003 when air temperatures were hovering at 100°F were within DEQ standards.

Chemical Contamination

All action alternatives present some risk of water contamination due to the use of fuel products and dust abatement chemicals that have the potential to enter streams if spilled or misapplied. Dust abatement with calcium chloride, magnesium chloride, or ligninsulfonate would be applied to approximately 16.5 miles of road under alternatives 2, 3, 4, and 6. Alternative 5 would treat 4.5 miles with this substance. Some road segments would receive more than one treatment (Table 47). These products would be applied to gravel road surfaces used for log haul at a frequency of 1 treatment for every 1-5 million board feet of timber hauled (depending on site specific road conditions). Excessive rates of application could potentially increase either the surface runoff or the migration of the material through the soil to stream channels. The primary risk of water contamination would occur with a spill near a waterway. Concentrations in excess of 10,000 ppm³⁸ could be expected if a transport truck spilled into a perennial stream.

Table 47. Estimated Dust Abatement Applications by Road Segment for the Baked Apple Action Alternatives.

Road Segments with Dust Abatement				Number of Applications by Alternative				
Road	Begin	End	Miles	2	3	4	5	6
4720	Intersect w/4714	Intersect w/4720-005	0.76	4	4	4	1	4
4720	Intersect w/4720-005	Intersect w/4720-255	2.58	3	3	3	1	3
4720	Intersect w/4720-255	Intersect w/4720-410	3.96	2	2	2	0	2
4720	Intersect w/4720-410	Intersect w/4720-480	0.85	2	2	2	0	2
4720	Intersect w/4720-480	Intersect w/temp spur to unit 75	1.40	1	1	1	0	1
4720-005	Intersect w/4720-005	Intersect w/4720-025	1.12	2	2	2	1	2
4720-	Intersect	Intersect	2.53	2	2	3	0	2

³⁸ ppm stands for parts per million, or 1 part of a contaminant per million parts of water. It is equivalent to a concentration of 1 milligram per liter.

Road Segments with Dust Abatement				Number of Applications by Alternative				
005	w/4720-025	w/temp spur to unit 48B						
4720-005	Intersect w/temp spur to unit 48B	Intersect w/4720-145	2.83	2	2	3	0	2
4720-005	Intersect w/4720-145	Intersect w/4720-155	0.48	1	0	1	0	1
Total Miles Treated at Least Once				16.5	16.0	16.5	4.5	16.5
Cumulative Total Miles Treated as a result of Multiple Treatments				35.2	34.8	40.6	4.5	35.2

Table 47 represents an estimate of anticipated dust abatement treatments under the various alternatives. Actual number of treatments may vary depending on weather and the numbers of seasons the timber sales operate.

Calcium and magnesium chloride are highly soluble and move through the soil with water. Their movement is largely dependent on the rate of application, the rate and frequency of rainfall, the drainage characteristics of the area of application and the chemical and physical nature of the soil. During periods of long duration or high intensity rainfall, in areas of high surface runoff, or in areas of high soil permeability, calcium and magnesium can move considerable distances either as surface runoff or as soil leachate (materials dissolved in water that is within the soil). Surface runoff typically drains into streams, lakes, or ponds whereas leachates feed ground water. Under these conditions it is the constituent ions of calcium, magnesium, and chloride (Ca^{2+} , Mg^{2+} , and Cl^-) that migrate through the environment.

Calcium and magnesium ions are readily held by soil particles while chlorides tend to remain in solution and potentially infiltrate ground water or runoff into surface waters. Calcium and magnesium are very common elements in soil and water and because they readily bond with soil particles they typically do not migrate far from their point of application, which is the case of dust abatement chemical application (USDA, 1997). Because chlorides do not bond well with soil particles and tend to migrate, their effects are more widespread. Although chloride is present in all natural waters it usually occurs in concentrations of less than 50 ppm (parts per million). Trout begin to suffer significant effects from chlorides when concentrations reach 400 ppm. Concentrations in excess of 10,000 ppm place all fresh water biota in immediate jeopardy. At typical application rates these concentrations would not be expected to occur (USDA, 1999).

Ligninsulfonate is another type of dust abatement material that may be used with the action alternatives. Ligninsulfonates are the byproduct of pulp and paper mills. Lignin is extracted as a waste product from wood chips with the use of salts and sulfurous acid resulting in ligninsulfonate. Like calcium and magnesium chloride, ligninsulfonate move through the environment with water. With increasing amounts of rainfall ligninsulfonates are easily washed away. Clay soils hold these materials more tightly than other soil particles, but not tightly enough to hold them in the presence of flowing water. Although ligninsulfonates can be washed off the road surface, leaching from stabilized road soils has been found to be minor. Soils best suited for ligninsulfonate treatment are those with 70-100 percent of the particles pass through a 0.75 inch sieve and 20% -50% are silt and clay (Schwendeman 1981). Roads in the Baked Apple planning area that would receive

dust abatement compounds are composed of materials that are conducive to the application and retention of these compounds.

When introduced into a waterway, ligninsulfonate will increase the biological oxygen demand³⁹ of the water and could impart a slight yellow tint to the water (Schwendeman 1981). Ligninsulfonates have been shown to exhibit direct toxic effects on rainbow trout. The LC50 at 48 hours (concentration of ligninsulfonate which would be lethal to 50% of the test population within 48 hours) was calculated to be 7,500 ppm. Effects on growth have been observed at sub-lethal concentrations as low as 160 ppm because ligninsulfonates seem to impair the activities of several digestive enzymes.

The discoloration of the water column that could occur may result in less light penetrating the water column and potentially affecting plant photosynthesis. The supply of oxygen to the system could be diminished, as ligninsulfonates bond with other materials, settle to the bottom and begin to decay. Concentrations in excess of biotic tolerance levels or concentrations that would be expected to impart color to the water column or increase the biological oxygen demand could be reached by excessive application rates or application during wet weather.

Overview of Existing Water Quality Conditions

The primary impact of the wildfire of 2002 on water quality is the increase in water temperature due to riparian canopy loss and possible channel widening due to anticipated elevated peak flows. Erosion will increase the nutrient loading to the stream; however, numerous studies were evaluated with few reporting notable changes in pH due to fire (Landsberg and Tiedemann 2002). pH and dissolved oxygen levels may fluctuate but will not be outside the natural range of variability, since stand replacement fires are a natural occurrence in this basin. Anticipated storage of sediment in the recently placed large wood in Limpy Creek will likely decrease algae and the associated pH swings since the wood will accumulate gravel and other sediments that harbor grazing insects that keep algae populations in check. Planning area streams have not been recently exposed to pollution from oil products or dust abatement chemicals since no timber sale projects have occurred in the planning area for seven years.

Environmental Effects on Nutrients, pH, and Dissolved Oxygen

Direct Effects

Riparian canopy closure that provides shade would not be reduced nor would channel widening be increased due to any of the Baked Apple alternatives. Therefore, DO and pH levels would not be influenced by changes in stream temperature due to implementation of any of the Baked Apple alternatives.

Nutrient input primarily occurs through sedimentation. The inputs of sediment and nutrients from burned plantations and riparian reserves will be many times greater than any of the minor sedimentation from logging and site preparation associated with the various action alternatives. No-treatment riparian buffers would encourage nutrient

³⁹ Oxygen is used when organic matter decomposes. This results in more “demand” for oxygen by aquatic organisms. In cases when demand is greater than the supply, then a die off could occur.

consumption by both unburned and newly sprouted riparian vegetation before entry into the stream.

Indirect Effects

No indirect effects to downstream water chemistry in the North Umpqua River are expected as a result of implementing any of the Baked Apple alternatives. Any minor levels of increased nutrients in Panther Creek from this salvage project and its connected actions would be diminished by the much greater volume of water in the North Umpqua River. In the unlikely event that nutrient loading from this salvage project results in elevated nutrients and increased primary productivity in the North Umpqua River, the effects are expected to be short-term (Beschta et al. 1990).

Indirect effects to the aquatic environment from changes in water chemistry are possible at a future time if fires were to start when fuel accumulations on the forest floor are higher than they are today. The alternatives that result in a higher risk of larger future fires increase the risk of reduced stream shading and nutrient loading resulting from such hypothetical future fires. Alternatives 1 and 5 present more risk of future indirect effects to water chemistry and the aquatic environment than the other Baked Apple alternatives.

Cumulative Effects

The indirect effects of the fuel load left behind after implementation of the various alternatives could result in cumulative effects to water chemistry when added to the present and reasonably foreseeable effects of the 2002 Apple fire. If reburns occur in the next three decades as a result of residual fuel loads, stream temperatures would not have fully recovered from the 2002 fire. The larger areas modeled to potentially burn under Alternatives 1 and 5 would have the greatest potential to affect cumulative water temperatures thereby affecting nutrient loading. Alternatives 2, 3, 4, and 6 would all have a lesser and similar potential for cumulative effects of prolonging elevated water temperatures and associated lower concentrations of dissolved oxygen and higher levels of nutrients and pH within Panther Creek. For such a cumulative effect to be experienced in the North Umpqua River, more fires within other drainages that flow into the North Umpqua would have to occur, but such widespread fires would not be a result of any aspect of any Baked Apple alternative.

Environmental Effects of Water Contamination

Direct Effects

A dust abatement spill or petroleum spill could potentially result in direct effects to aquatic resources and the beneficial uses of water. The haul routes within the planning area are narrow and winding and increased truck traffic elevates the potential for an accident. Several haul roads parallel stream bottoms. If an accident were to occur near a stream, fuel or dust abatement chemicals could enter live waterways. This could result in immediate physical harm from a truck entering a waterway, water pollution that could kill or otherwise harm aquatic organisms, and the additional disturbance associated with cleanup. Those action alternatives with the most amount of haul present the most risk of water contamination.

The risk of water contamination due to the application of dust abatement is minimized under all action alternatives by several mitigation measures that would be required under the timber sale contract. Dust abatement with chemical compounds under all action alternatives include maintaining an average 25 foot no treatment buffer at perennial stream crossings and maintaining a 1 foot no treatment area adjacent to the outside edge of the ditch line. Moreover, the application of dust abatement materials would occur in a window of time when no rain is forecast for at least three days. The buffering of applications away from perennial stream crossings has been found to effectively mitigate pollution of adjacent waters (USDA 1999). The rate of application of dust abatement compounds in the Baked Apple Planning area would be “typical” and therefore is not expected to contribute to adverse riparian or aquatic affects.

The most commonly used dust abatement compounds by the Forest Service are calcium and magnesium chloride and ligninsulfonates. These compounds are typically used on a limited basis and at low application rates, as compared to study areas where the most noticeable effects have been seen. Based on the literature review and typical application rates for dust abatement purposes that would be used in the Baked Apple planning area, effects from these compounds to plants and animals in the riparian and aquatic environments would be negligible.

Timber sale purchasers would be required to have spill prevention and recovery equipment on site, they would be required to develop spill prevention plans if substantial amounts of fuel or other pollutants are stored in sale areas, and traffic control measures would be required in the timber sale contract. All these requirements, detailed in Chapter 2 and in the Best Management Checklist (Project Record) function to diminish the chances of any direct effects to aquatic resources and the beneficial uses of water from project-related pollutants.

Indirect Effects

Pollution of off-site or downstream waters is possible if trucks transporting fuel or dust abatement compounds were to spill into a river or stream enroute to the project area. The likelihood of this occurring is proportional to the amount of fuel and dust abatement used in the various action alternatives. Alternative 5 would use the least of these materials and would result in the least risk of indirect effects to downstream beneficial uses due to water contamination. Alternatives 2, 3, 4, and 6 would present more risk of indirect effects to downstream beneficial uses because the amount of potentially polluting products transported to the project area is estimated to be more than three times the amount compared to Alternative 5. These alternatives present similar risks of an accidental spill contaminating off-site or downstream waters and the beneficial uses of those waters. The likelihood of an accidental spill is believed to be low; however no mitigation measures would be applied to the transport of potential pollutants outside the timber sale areas.

Cumulative Effects

Most past and on-going land management operations throughout the Umpqua River basin such as silvicultural activities, timber sales, and all forms of road work use a variety of potentially polluting products (such as petroleum, concrete, adhesives, cleansers, herbicides, etc) that pose a risk of entering waterways if spilled or mishandled. The level

of timber harvest and associated road work on Federal land located primarily in the upper elevations of the Umpqua River basin has diminished over the last two decades relative to the previous three decades. Therefore, the level of additive effects that can contaminate water from such actions has also diminished.

The potential chemical treatment of Diamond Lake with rotenone⁴⁰ (in the North Umpqua watershed) to kill tui chub fish, that are themselves contributing to the eutrophication and pollution of Diamond Lake, is reasonably foreseeable. The biological effects of such a chemical treatment, should it occur, would not be detected at all downstream from Diamond Lake since the lake level would be lowered by a substantial degree disallowing any contaminated water to flow downstream of Diamond Lake until the rotenone has broken down to undetectable levels (Diamond Lake Restoration Project DEIS). Thus, this reasonably foreseeable lake project would not be expected to contribute to any additive impacts to aquatic organisms in the North Umpqua River in the vicinity of the Baked Apple project or further downstream.

Potential contamination of waters within the River basin associated with private industrial forestry operations, intensive agricultural operations (using pesticides, fertilizers, other petroleum products, and herbicides), and city and town development and use by people (sewage, plus all the above mentioned potential pollutants and others not mentioned) has not diminished. Water contaminations from these sources can be expected to increase as demand for food and natural resources increases with the human populations. Therefore, the lower areas of the Umpqua River basin are where the cumulative effects of all the additive forms and sources of water contamination would be most likely realized.

The chances of any of the Baked Apple action alternatives resulting in any cumulative effects to water contamination hinges on whether a substantial spill of petroleum or dust abatement products occurs. Should a spill occur and clean-up measures fail, a cumulative effect could be realized. This is particularly true the further downstream an accidental spill occurs.

Conclusions

Based on the above discussion, none of the Baked Apple alternatives are expected to appreciably affect water quality over the long-term (decades, or longer), and none are expected to degrade the chemical contamination/nutrients indicator considered by NOAA Fisheries unless an accidental spill were to occur. The chances of such a spill are offset as much as possible by a series of best management practices required in the timber sale contract of the action alternatives. Any impacts to water quality associated with contamination of water due to timber sale operations would be short-term and likely localized at the 6th or 7th field watershed. As such, the broad-scale goals of the ACS would not be impacted.

⁴⁰ Rotenone is a chemical derived from a family of tropical plants that is used to kill unwanted, non-native fish.

PEAK FLOWS

Affected Environment

The Aquatic Conservation Strategy calls for the maintenance and restoration of in-stream flows described in ACS objective 6. This ACS objective addresses the timing, magnitude, duration, and spatial distribution of peak flows. Peak flows also affect the sediment regime addressed in ACS objective 5 discussed later in this chapter. The road drainage network and associated peak flow changes are used as an indicator of the environmental baseline by NOAA Fisheries for conferencing. This indicator is classified as 'not properly functioning' in the Panther sub-watershed because of the road densities and amount of hydrologically unrecovered area in the sub-watershed following the fire.

Stand structure influences snow accumulation and the rate at which snow melts. More snow can accumulate in openings than under forest canopies during snowfall events due to wind eddies in the openings. When rain occurs, the snow packs melt rapidly. Some of the most severe flooding in areas that receive snowfall is attributed to rain-on-snow events.

Large channel-forming floods can be attributed to rain-on-snow or intense rain events in the North Umpqua sub-basin. These events trigger landslides and fluvial erosion. Research shows that statistically significant peak flows are associated with canopy removal and roads in smaller drainages (Jones and Grant 1996; Jones 2000). In the transient snow zone, where the air temperature frequently hovers around 0 °C during the winter, rain-on-snow events can occur fairly frequently. While the Umpqua Forest Plan stipulates the transient snow zone is between 2,000 and 5,000 feet in elevation (LMRP IV-64), further analysis has identified the range of 3,600 to 4,600 feet in elevation as the area most likely to experience rain-on-snow events. Much of the Baked Apple planning area is within the transient snow zone.

Much of the Baked Apple Planning area had been previously harvested creating openings that are susceptible to rain-on-snow events. Since initial entry during the late 1950's all the drainages within the planning area have had significant harvest activity ranging from 30% within Limpy Creek to 44% within the Fairy drainage (Figure 59).

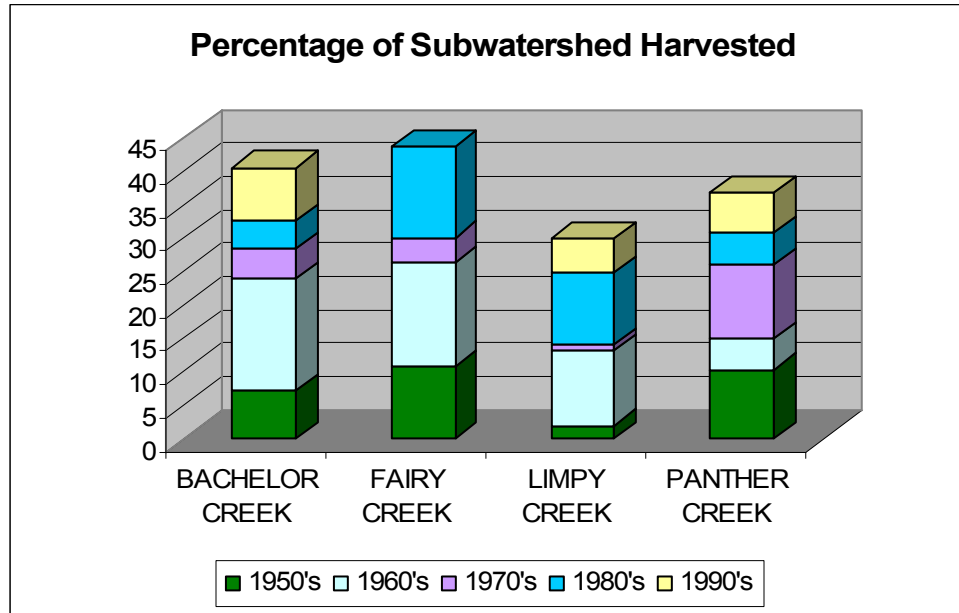


Figure 59: Clearcut Harvest within the Planning Area by Decade.

Standards and Guidelines in the Umpqua National Forest LRMP require an analysis of hydrologic recovery if more than 25% of a watershed is harvested. A land area such as a harvest unit is considered to be hydrologically recovered when it has canopy closure of at least 70% with average tree diameters of at least 8 inches. These conditions provide snow interception and buffer warm wind movement. The Hydrologic Recovery Percentage (HRP) model is used to estimate the peak flow response to canopy removal. Following clear cutting or stand replacement fire, hydrologic recovery is minimal until the re-growing forest reaches an age of 10 to 15 years. Stands are considered to be fully recovered at approximately 30 to 39 years depending on the tree growth rate within the unit. The drainages of Panther Creek were more than 86% recovered from timber harvest prior to the Apple Fire (USDA 2003).

Table 48. Hydrologic Recovery Following Previous Timber Harvest and Prior to the 2002 Apple Fire.

Drainage	Drainage Area (acres)	Pre-Fire HRP
Bachelor Creek	2723	89
Fairy Creek	2055	88
Limpy Creek	3134	86
Panther Creek	4255	90

While pre-fire HRP values were nearly 90%, this procedure only takes into account the reduction in canopy due to harvest (Table 48). Natural openings such as rocky outcrops, meadows and areas un-recovered from the previous fire as well as roads are not

incorporated into the HRP analysis. Approximately 40% of the sub-watershed had less than 70% canopy closure before the 2002 wildfire. After the fire, openings with less than 70% canopy closure increased to 58% in the Panther Creek sub-watershed (USDA 2003). The canopy closure in Panther Creek 6th field dropped approximately 18% due to the 2002 wildfire.

Following the 2002 fire year, a wildfire effects evaluation project (WEEP) was done that assessed the susceptibility to peak flow increases following the fires of 2002 (USDA 2003). A qualitative peak flow assessment was adapted from the Augusta Creek study on the Willamette National Forest (Cissel et al, 1998) to address potential bank erosion and channel scour. Peak flows were analyzed by assessing the potential of different areas of the watershed to accumulate and melt snow and to store ground water. Snowmelt was grouped by aspect with the highest melt rates for south and west facing slopes. Soil depth was used to assess ground water storage. Elevation zones, aspects and soil depths were merged to identify areas of high susceptibility to peak flow due to rain-on-snow events (Figure 60).

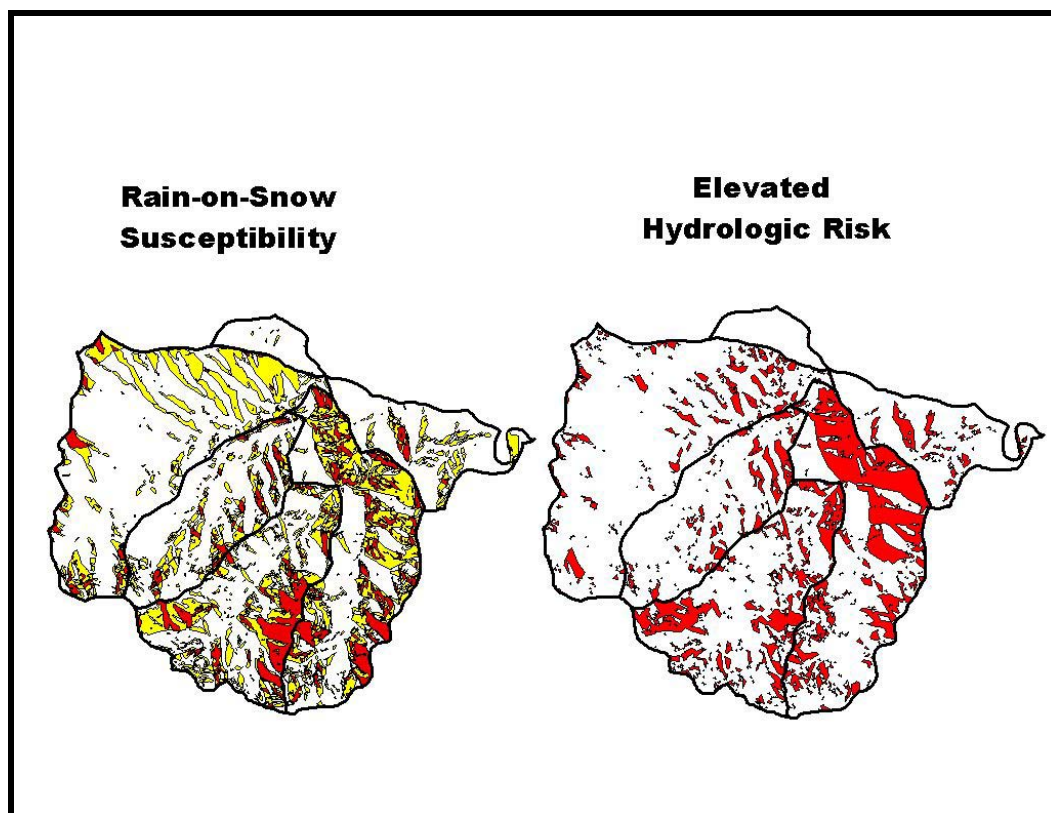


Figure 60. Baked Apple Planning Area susceptibility to peak flow increases and elevated hydrologic risk due to reduction of canopy closure (<70%) after the 2002 Apple Fire (white=low, yellow=moderate, and red=high susceptibility to peak flows).

About 21 percent of the Panther Creek sub-watershed was modeled in the WEEP to have elevated peak flow risks where trees were killed on areas of shallow soils and southerly aspects at mid elevations (3,600-4,600 feet above sea level). Within the Panther sub-watershed the risk for peak flow response is not equally distributed among the smaller 7th

field drainages (Table 49). Thirty-eight percent of Limpy Creek is at high risk for peak flows whereas the Panther 7th field drainage has only 9% in the high range. Peak flow response to the wildfire is expected to be greatest in the Limpy and Bachelor drainages. Streams within these areas or that are fed by them will likely have increased fluvial erosion, scouring, and habitat modification due to the fire. Streams with little intact riparian vegetation and channel roughness are likely to be most affected by the 2002 Apple Fire.

Table 49. Susceptibility to Peak Flow Increases and Elevated Hydrologic Risk Due To Reduction Of Canopy Closure (<70%) due to the 2002 Apple Fire.

7th field Drainage	2002 Stand Replacement Fire	Moderate to High Rain on Snow Susceptibility	Elevated Hydrologic Risk
Bachelor Creek	28%	44%	26%
Fairy Creek	25%	24%	12%
Limpy Creek	61%	50%	38%
Panther Creek	7%	25%	9%
South Apple Facial	31%	14%	8%

In addition to canopy loss, ground compaction caused by tractor harvest and road construction, interception of ground water at road-cut slopes, and extension of the channel network due to road ditch lines and relief culverts all function to increase peak flows by altering the timing of water delivery to the stream network. Surface compaction reduces infiltration thus increasing surface runoff and potentially causing mass wasting in areas where overland flow is routed onto unstable slopes. Subsurface flow may be partially intercepted along road cuts and transferred to more rapid runoff via ditch lines. Such ditch lines may deliver fine sediment, as well as route ground and surface water directly into stream channels (Wemple et al. 1996).

A stream crossing culvert inventory was completed throughout the Panther Creek sub-watershed the winter after the fire. The Northwest Forest Plan includes a standard and guideline that calls for a determination of each road on the objectives of the Aquatic Conservation Strategy (ROD C-32). This inventory was done in the planning area to meet this standard and guideline and to provide information for the Baked Apple Roads Analysis. The ditch length draining directly into a stream was measured at every stream-crossing culvert (Table 50). Many of these ditches act as stream channels during rainfall and snowmelt events by accumulating water and rapidly routing water directly to stream channels potentially increasing peak flows. There are likely many ditch relief culverts with gullies connecting to the stream system that were not measured during this survey. Therefore channel extension due to the road system is liable to be underestimated.

Table 50. Estimated Channel Extension from Ditch Lines in the Baked Apple Planning Area.

Drainage	Road Density (mi/mi ²)	Ditch Length (feet)	% Channel Extension
Bachelor Creek	4.6	14,654	13
Fairy Creek	4.3	8,281	10
Limpy Creek	3.7	7,711	6
Panther Creek	4.7	39,862	21
Lower Apple Facial	2.5	3,953	9

Limpy Creek shows the least channel extension at 6%. Channel extension is greatest within the Panther Creek drainage at 21%. Peak flows in the planning area may be augmented due to channel extension of the road system increasing the risk of sediment transport and fluvial erosion.

Jones and Grant (1996) reported that peak stream flows on the Willamette National Forest increased from 24% - 32% in basins the size of Panther Creek when greater than 15% of the basin was harvested and when 4% - 5% of the basin area was occupied by roads (equating to a road density of 3-4 miles/square mile). In the Panther Creek sub-watershed following the fire, 58% of the drainage area now has less than 70% crown closure and road densities exceed 4 miles/square mile (USDA 2003a).

The increase in peak flows associated with the canopy loss due to the 2002 wildfire is not thought to be outside the range of natural variability as this drainage has likely had many stand replacement fires over the centuries given its steep topography and dry slope aspects. The last major stand-replacing fire occurred in the late 1800's, and it burned in the same vicinity on the same steep slopes of Limpy Creek leaving a similar landscape pattern as the 2002 Apple Fire (USDA 2001). The peak flow increase that can be attributed to the road system is outside the range of natural variability and is expected to remain as such over the long-term since any significant degree of road decommissioning is predicted to be minimal in this matrix land allocation.

The environmental baseline for changes in peak flows used by NOAA fisheries in the conferencing process is currently considered to be 'not properly functioning'. This is due to pronounced changes in peak flows due to the 2002 fire and the existing road system in comparison to an undisturbed watershed of similar size and geology.

Environmental Effects

Direct Effects

All Baked Apple harvest prescriptions remove only dead trees, except those green trees that present safety hazards or that must be cut to facilitate the logging such as tailholds. The dead trees targeted in this project, while retaining canopy as high as 58% in the uplands, do not have the ability to intercept snow compared to a forest canopy composed of an overstory of needles and leaves. While some interception of the snow may occur, the effects on peak flows would likely be immeasurable. Removal of these dead trees under all action alternatives would have no effect on peak flows within the sub-watershed. Moreover, the incidental removal of individual scattered green trees that are

found to be safety hazards or that must be cut to facilitate the logging would not result in any direct effects on peak flow increases since the canopy closure that provides hydrologic recovery functions at the stand level not the individual tree level. Therefore, hydrologic recovery would not be affected under any alternative and the beneficial uses of water would not be affected due to peak flow increases within Panther Creek or the North Umpqua River.

Indirect Effects

The replanting of the harvested units would hasten the future recovery of canopy closure and the peak flow regime in the sub-watershed, resulting in a beneficial effect to the aquatic environment. All harvest units would be planted along with adjacent riparian areas, except in Alternative 5 where natural regeneration would occur in adjacent riparian areas. Also, about 1,600 acres of burned plantations under all action alternatives would be planted. Alternative 4 would harvest the most units; therefore, more acres would be replanted resulting in the most future benefit to hydrologic recovery. Alternative 5 proposes the least harvest and re-planting of the action alternatives with the least indirect benefits to aquatic systems due to hydrologic recovery. Money would be made available as a result of KV funds generated from the sales for replanting. While funds for reforestation would likely become available through various sources other than generated KV funds, the amount and when money would become available is unknown. Units associated with the various action alternatives would probably experience a minimum of a 3 to 5 year delay after the fire before reforestation occurs. Natural regeneration under Alternative 1 may take well over a decade to establish due to the severity of the wildfire and lack of a natural seed source in many locations within the burn. Alternative 1 would result in no indirect beneficial effects to aquatic resources from shortening hydrologic recovery times.

Cumulative Effects

The canopy removal due to historic timber harvest, the 1987 Apple Fire, as well as the extensive road network in the planning area have together affected peak flows to varying degrees over the last few decades. However, the harvest of dead trees under the various action alternatives of the Baked Apple project would not contribute to any cumulative effect in either Panther Creek or the North Umpqua River because the dead trees to be salvaged do not function to influence the peak flow process. The reasonably foreseeable reforestation (Table 10, in the beginning of this chapter) associated with the Apple Seed timber stand improvement project and other acres not connected to the Baked Apple alternatives would help to speed the watershed recovery process by at least a decade over Alternative 1.

The indirect effects of the fuel load left behind after implementation of the various alternatives could lead to reburns in the watershed potentially resulting in cumulative effects to the aquatic ecosystem. If any reburns occur in the next three decades, hydrologic recovery would be set back extending the period of peak flows. Additional setbacks in hydrologic recovery when added to the years of elevated stream flows due to the loss of live trees with clearcutting and wildfires would expose even more generations of aquatic organisms to the impacts and stresses of elevated winter flows. The larger areas modeled to potentially burn under Alternatives 1 and 5 (Figure 29 in fire section) would have the greatest potential to add to cumulative peak flow increases. Alternatives

2, 3, 4, and 6 would all have a lesser and similar potential for resulting in cumulative effects to prolonging peak flows in Panther Creek.

Conclusions

Based on the above discussion, none of the Baked Apple alternatives are expected to affect the long-term goals set forth under Aquatic Conservation Strategy objective 6 by changing flow conditions, and none would degrade the drainage network/peak flow indicator considered by NOAA Fisheries in the short-term. In the longer term, alternatives that leave more residual fuels may interrupt hydrologic recovery of the 6th-field Panther Creek watershed with some minimal downstream effects in the North Umpqua River. Larger fires could also spread into the 5th-field Middle North Umpqua watershed potentially setting back hydrologic recovery at a broader scale.

EROSION AND SEDIMENTATION - TRACKED AS A SIGNIFICANT ISSUE

It was determined during scoping that the salvage of dead trees and related activities has the potential to impact the beneficial uses of the aquatic system through increased delivery of sediment to Panther, Limpy, Fairy, and Bachelor Creeks. The measures selected to help assess the alternatives with respect to erosion and sedimentation focus on two of the processes that result in sedimentation—the mass wasting process and the surface erosion process. These aspects of erosion and sedimentation were selected as indicators to be tracked through the analysis because the proposed salvage would have more influence on these aspects of erosion and sedimentation than the other forms of erosion and sedimentation analyzed here. Sediment is defined as that portion of erosion that enters a stream as solid material such as soil, rock and wood.

The Aquatic Conservation Strategy calls for the maintenance and restoration of the sediment regime under which aquatic ecosystems evolved as described in ACS objective 5. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage, and transport. The Aquatic Conservation Strategy focuses on maintenance and recovery of ecosystems over broad landscapes with consideration given to how the aquatic and riparian dependent systems interact with and depend on natural disturbance processes over the long-term.

Sediment and turbidity are expected to increase and potentially remain elevated during winter storm events as a result of the erosion following the 2002 Apple Fire. The sedimentation of aquatic systems would come in the form of mass wasting (landslides), fluvial (stream caused) erosion, and surface erosion. These three natural erosion processes are expected to contribute to post-fire increases in the sediment regime to immediate downstream areas and further downstream in the North Umpqua River. Increased erosion following a fire can be both episodic and chronic, depending largely on precipitation amount, duration, and intensity. Mass wasting is episodic and triggered by large storm events whereas surface and fluvial erosion tend to produce chronic levels of sediment and are less dependant on large storm events.

In addition to the natural processes that result in sedimentation (surface erosion, mass wasting, and fluvial erosion) following fire, road-related sedimentation from the existing road network, and sedimentation related to logging, including log haul on roads, can be expected.

MASS WASTING

Affected Environment

The dominant mechanism of sediment production to streams within steep, dissected landscapes such as the Baked Apple planning area is mass wasting⁴¹ from shallow-rapid landslides (MacDonald et al. 1991). Shallow-rapid landslides are generally initiated by infrequent high-intensity rainfall events during the late fall and winter months, usually in conjunction with rapid snowmelt within the influence of the transient snow zone (Swanston and Swanson 1976). The transient snow zone is between 3,600-4,600 feet in elevation in the Baked Apple planning area (Hydrology Report, Project Record).

The mass wasting disturbance process exhibits a broad range of natural variability within steep, well-dissected forested landscapes of western Oregon. Infrequent high intensity rainfall events can initiate shallow-rapid landsliding including debris flows⁴² that can cause significant alteration to stream channels by scouring, transporting, and redepositing sediment and wood into higher order stream channels (Figure 61).

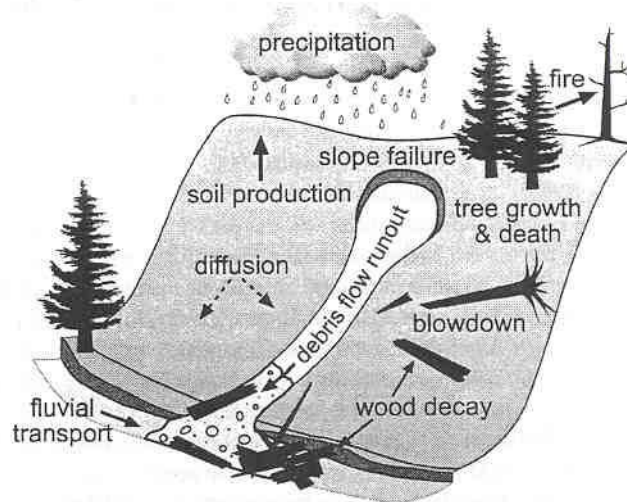


Figure 61. The Debris Flow Process (from Lancaster et al. 2001)

Debris flows are the primary mechanism for the introduction of large wood into a properly functioning aquatic ecosystem. High intensity rainfall events are infrequent, and statistically occur only several times within a span of a century. When such a climatic event follows a large wildfire, the volume of sediment can be at its upper range of natural variability and several orders of magnitude above its ambient baseline level. Mass wasting and associated sedimentation of streams is often exacerbated by management activities typically associated with timber harvest and road construction. Following disturbance by stand replacement fire, the potential for shallow-rapid landslides to begin contributing to

⁴¹ Mass wasting is the down slope movement of intact masses of soil, rock, and organic debris under the influence of gravity. It includes debris avalanches, debris flows, rotational slumps and earth flows—collectively termed landslides and soil creep.

⁴² Debris flows are rapid movement of a large quantity of material (wood and sediment) down a stream channel during storms and floods. This usually occurs in smaller streams and results in scouring of the streambed. Debris flows are also called debris torrents.

the sediment budget may occur in about 3 years and continue for a decade or more due to diminished tree root strength. Once landslides occur they immediately set up a secondary process of surface erosion as gravity and rain displaces soil on oversteepened slopes into channels created by the landslide and debris flows.

Human caused sources of sediment within the Middle North Umpqua watershed over the last 50 years have been mainly associated with timber harvest and the road network. Peak levels of clear cutting occurred in the 1960's and again in the 1980's.

The rate of management-related landslides is an indicator of watershed condition used in conferencing with NOAA Fisheries. Prior to the 2002 Apple Fire, a chronological landslide inventory, based on aerial photo interpretation, was completed for the Middle North Umpqua watershed analysis using 1946, 1966 and 1997 photos. A total of 69 landslides were identified within the Baked Apple planning area--28 (41%) were natural occurring, 18 (26%) were timber harvest related, and 23 (33%) were road-related (Table 51). Although management-related landslides seemingly account for almost 60 percent of the total landslides recognized in the Baked Apple planning area, this ratio is likely an overestimate since the slides in harvest units and along roadsides were more obvious on the photos compared similar sized natural slides that may be obscured beneath the dense tree canopy.

Table 51. Landslides identified by aerial photo interpretation within the Baked Apple planning area (from the 2001 Middle North Umpqua Watershed Analysis).

Before 1946			From 1946 to 1966			From 1967 to 1997		
N	H	R	N	H	R	N	H	R
3	0	0	20	7	8	5	11	15

N=Natural landslide; H=harvest-related landslide; R=Road-related landslide

The overwhelming majority of landslides identified in the 2001 aerial photo landslide inventory were debris avalanches that range in size from a minimum of <0.1 acre to a maximum of 3.5 acres. Debris avalanches typically only slide a short distance and remain on the hillslope rather than enter a stream. The mean area of these debris avalanches averaged less than 0.5 acre. Only a fraction of the displaced landslide debris resulting from these slope failures has actually been delivered into aquatic habitat, as most of it likely remained stored on the hill slope outside the influence of riparian habitat.

Three debris flow tracts were identified in the photo inventory that caused significant alteration to stream channel morphology within the Baked Apple planning area. Debris flows typically travel substantial distances down slope from their initiation and enter streams. A massive debris flow some 9,000 feet in length and roughly 17 acres in surface extent scoured the main stem of Fairy Creek prior to 1966 due to a fill slope failure along Forest Road 2703. A second fairly large debris flow scoured about 7,000 feet of an unnamed tributary to Panther Creek also prior to 1966. This debris flow is thought to have initiated from a natural mass failure on the north flank of Lookout Mountain and a harvest-related landslide below Forest Road 2703-000. Both of these substantial debris flows likely occurred during the 1964 flood, a 100-year flood event in the North Umpqua sub-basin. Another smaller debris flow scoured roughly 3,000 feet of an unnamed tributary to Bachelor Creek sometime after 1976, but prior to 1989. This debris flow was initiated by a road fill failure along road 4714. These three debris flows likely introduced

large wood into the aquatic system, as opposed to the much smaller debris avalanches that stored much of the landslide debris, including entrained coarse wood on the hill slope.

The environmental baseline for landslide rates, used by NOAA Fisheries for conferencing on fish species that may become federally listed, is classified 'at risk' because the 2001 aerial photo inventory found more management-related landslides in the planning area than naturally occurring landslides (Table 51).

Stream inventories have further demonstrated that several main stem channel reaches within the Baked Apple planning area were severely lacking in large wood, which can be partly attributed to the fact that roading and harvesting removed trees that would have been delivered to streams in landslides under a properly functioning condition. Moreover, the 'at risk' classification was assigned because the Apple Fire burned much of the existing, in-channel wood within some of the burned non-fish bearing channels of Limpy, Fairy, and Bachelor Creeks. On the other hand, however, the 2002 BAER channel wood treatments and the 1995 and 1997 Fairy Creek instream wood additions have helped ameliorate the depleted instream wood condition to a substantial degree. In addition, over the next 10 years, the Apple Fire will function to deliver important large wood, rock and sediment into the main stem stream channels of Limpy, Fairy, and Bachelor Creek that have been deprived of such materials. All of these factors weighed in on assigning the "at risk" environmental baseline for the landslide process in the planning area.

SHALSTAB is a mechanistic, grid-based digital terrain model that can be utilized as a planning tool for delineating preferred sites of rapid-shallow landslides in a steep, well-dissected landscape. An advanced version of SHALSTAB was utilized to prepare the effects analysis for the Baked Apple Project Planning Area (Dietrich and Montgomery, 1998). This model helped satisfy the Umpqua NF LRMP Standard and Guideline requiring a risk and hazard assessment for soil mass movement and the protection of unstable areas at risk of failure from tree cutting and ground disturbance (LRMP IV-68).

Soil and topographic parameters were input into the model that represent site specific conditions of the planning area in order to estimate the relative potential for shallow-rapid landsliding across the dissected landscape of the Baked Apple project area (Geology Report, Project Record). SHALSTAB was the selected model for this analysis conducted by the interdisciplinary team (composed of several earth scientists and a fisheries biologist) because it is focused on the identification of shallow-rapid landslide potential—the type of landslide expected in the steep dissected topography where salvage is proposed.

Shallow-rapid landslides initiate in swales—areas of concave topography located on steep slopes between the ridge crest and the initiation point of first-order stream channels (often referred to as headwalls). During high intensity rainfall events subsurface flow converges within swales leading to increased soil saturation. As soil pore pressures increase, soil shear strength is reduced resulting in slope failure under extremely wet conditions.

Steep topographic swales gradually fill over the course of centuries with coarse-textured sediment transported by gravity (colluvium) from adjacent convex slopes. Colluvial swales undergo cycles of gradual filling and periodic instability (failure). Eventually, subsurface flow convergence leads to failure of all or a portion of the colluvial deposit (Montgomery et al. 1991). A failure results in an avalanche of material downslope. Such a failure may occasionally attain sufficient momentum (if enough water is present) to grow into a large channel scouring debris flow. Debris flows typically involve only a

portion of the colluvium stored in an individual swale, so debris flows can be released from a single swale over many years (Montgomery et al, 1991).

Tree roots counteract shallow-rapid landslides by providing reinforcement that holds the soil in place. Following disturbance, dead tree roots decay and lose their reinforcing strength. The period of diminished soil strength due to the loss of tree root reinforcement coincides with the greatest period of susceptibility to shallow rapid landslides--approximately 3 to 20 years after the disturbance, depending upon the degree of vegetative re-growth (Figure 62). During the period of minimum root strength, reinforcement could be 20 to 40 percent of its undisturbed value (Sidle 1985; Denning, 1994).

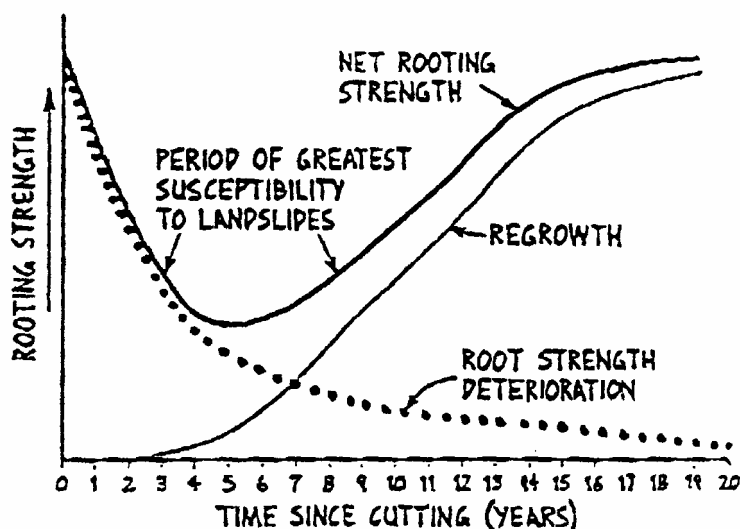


Figure 62. Period of diminished tree root reinforcement following timber harvest or severe wildfire (Sidle 1985).

Post-fire landslides that might mobilize into debris flows can only be expected to occur if the winter weather is extreme enough to cause them. A spike in the number of landslides would only occur if a substantial rain-on-snow winter storm follows a wet fall such as occurred during the winters of 1964 and 1997. If no such storm event occurs during the years of diminished root strength, then no substantial increase in sedimentation associated with shallow-rapid landslides can be expected as a result of the Apple Fire.

Based on the SHALSTAB analysis, a total of 464 acres or 3.3% of the planning area (13,925 acres) is considered to be 'at maximum risk' for rapid-shallow landsliding (Table 52). Elevated levels of risk for shallow-rapid land sliding are defined by hydrology ratio (q/T) values that are -3.1 or more on the negative scale (the larger the negative number the more unstable the area).

Table 52. Planning area acreage by SHALSTAB risk category.

SHALSTAB slope Stability Risk Categories	Hydrology Ratio, q/T values	Current Condition	
		Acres	Percent
Chronically Unstable	Less than -9.9	59	0.4
High Potential Instability	-9.9 to -3.1	403	2.9
Moderate-High Potential Instability	-3.1 to -2.8	650	4.7
Moderate Potential Instability	-2.8 to -2.5	1,616	11.6
Low-Moderate Potential Instability	-2.5 to -2.2	1,198	8.6
Low Potential Instability	-2.2 to 9.8	385	2.8
Stable	Greater than 9.8	9,612	69
Totals		13,925	100

The first two rows, chronically unstable and high potential instability, represent the “at maximum risk” areas adding up to 3.3 percent of the planning area.

The SHALSTAB analysis integrates parameters of slope gradient and slope convexity with geotechnical soil values that include internal friction angle⁴³, soil density when saturated, and cohesive soil properties to predict potential sites of slope instability. Slope gradient and slope convexity are represented with topographic data with 10 meter resolution. The site specific variables input into the SHALSTAB model resulted in a map that displayed relative degree of slope stability defined by risk categories (Figure 63). Field investigations were carried out to verify whether the sites identified by the SHALSTAB analysis qualified as unstable or potentially unstable ground, as per Forest Plan standards and guidelines (LRMP, IV-68-71).

⁴³ The internal friction angle is a measure of the sliding (frictional) resistance between interlocking soil particles of varying surface roughness along a hypothetical failure surface. Coarse-grained soils (with a sand and gravel component) typically have a higher friction angle than finer grained soils (silt and clay) when saturated, and therefore tend to be more stable. The soils within the planning area are predominantly coarse-grained.

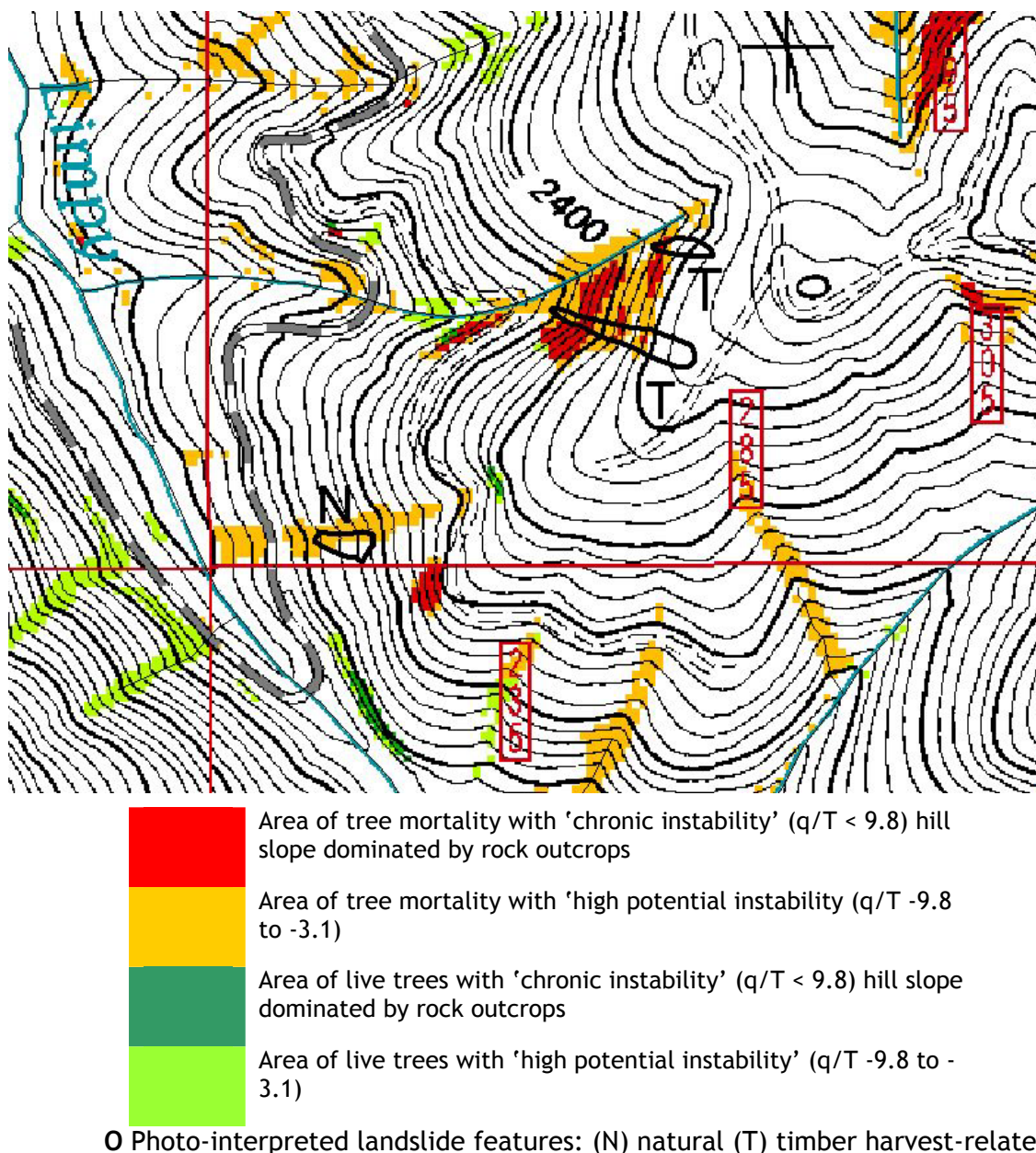


Figure 63. The SHALSTAB map for a portion of the planning area (on the east slope of Limpy Creek) used to predict the occurrence of shallow-rapid landslides. Each pixel is 10 meters square (40 pixels=1 acre). Clumped pixels of areas shown in red or yellow defined areas of potential instability that warranted field investigations.

The accuracy of SHALSTAB is mainly based on the resolution of topographic data. The 10-meter digital terrain model tends to underestimate slope steepness resulting in less slope convergence than actually exists on the ground.

Once field verified, such unstable and potentially unstable areas were established as part of the riparian reserves land allocation under a Northwest Forest Plan standard and guideline (ROD B-14). Unstable and potentially unstable mapped areas were removed

from harvest consideration in units: 59A, 48, 56, 75, 73, 78B, 74, 62D, and 49 totaling an area of 33.6 acres.

A portion of the sites were found to exhibit field signatures of recent or incipient slope failure, while others were not. All unstable areas mapped by SHALSTAB as 'at maximum risk' of instability and subsequently field verified during the intensive field investigations were removed from any harvest units in all alternatives. Since the predicted recurrence interval for slope failure within any colluvial swale is on the order of several centuries ranging upwards to a couple thousand years, field signatures of a past slope failure may not be evident during ground verification of predicted sites of instability.

Environmental Effects

Direct Effects

Salvage logging operations under all action alternatives would not increase the amount of acreage at risk for shallow-rapid landslides, nor would it increase the likelihood of causing mass wasting over and above what the fire is expected to cause. The trees to be salvaged under Alternatives 2, 3, 4, 5 and 6 are already dead, so the soil reinforcement function has already been severely reduced. The logging of the dead trees would not further affect the risk of mass wasting. To assist in alleviating any minor risks associated with soil gouging that could concentrate water, a mitigation measure in the timber sale contract would require the application of appropriate erosion control measures on any soil gouges that may reroute or concentrate runoff in order to spread water and allow for infiltration into the soil. Moreover, all logging operations would take place during the normal operating period, when soil is less susceptible to disturbance that could lead to localized changes in water routing. Therefore, in summary, the logging operations proposed under all action alternatives using helicopter, skyline, and loader logging systems would not directly affect slope instability beyond that already attributable to the Apple Fire.

Under all action alternatives, logging may occur on unstable areas not found in the field. The direct effect of such tree removal would be the lack of dead trees incorporated into the landslide debris and the missed opportunity of realizing a natural source of large wood for stream channels. Field investigations during the development of the alternatives deleted all discernable area of potential mass wasting. However, it is not possible to pinpoint every potential unstable area since some sites may fail in the next several decades as surface hillslope configurations change with time following the fire.

The SHALSTAB model results are used as a measure of the relative differences among alternatives with respect to various amounts of potential risk of cutting dead trees in areas that might slide, the potential of landslides traveling further without the entrained dead trees, and the potential that landslides would not deliver wood to downslope streams and riparian area (Table 53). This was selected as an indicator to help track how the various alternatives respond to the erosion and sedimentation issue and to help assess the differences among alternatives with respect to this significant issue.

Table 53. Acres of salvage by alternative proposed for harvest within areas mapped by the SHALSTAB model 'at maximum risk' for rapid-shallow land sliding. The higher the number of acres the more risk of shallow-rapid landslides occurring without the important large tree component. The information in this table is a measurement of the effects of alternatives on the erosion and sedimentation process.

Alternatives	Total Acres	Areas at risk of Instability	
		Acres	%
1	n/a	n/a	n/a
2	1,075	5.1	0.5
3	880	0.8	0.1
4	1,630	10.2	0.6
5	435	6.1	1.4
6	952	6.2	0.7

The acres of instability shown in Table 53 represent the aggregation of many very small, scattered points that may or may not actually be unstable. The field work completed by the interdisciplinary team focused on all of the larger discernable swales.

Though the SHALSTAB mapping has a relatively high degree of accuracy because of the 10 meter resolution of the digital terrain model, not all sites identified by the model were determined to presently be at risk of slope instability for shallow rapid landsliding. Nevertheless, each alternative contains a different mix of proposed salvage sale units that have varying sensitivity and susceptibility to mass wasting potential with associated risk of removing dead trees that might someday be delivered in a landslide to a stream or that would function to slow the momentum of a debris flow (Lancaster et al. 2001).

Alternative 3 was developed, in part, to reduce erosion potential (both chronic surface erosion and episodic mass wasting) and thereby lessen the potential for sediment delivery into aquatic habitat. This alternative has the least number of acres identified by the SHALSTAB model to be at maximum risk for shallow-rapid landslides. Only 0.8 acres (representing a number of small scattered locations) are indicated by the model to be at maximum risk for shallow-rapid landsliding where salvage logging operations are proposed. For Alternative 3, in addition to the areas drop from harvest that were field verified as having risk of slope instability, the areas mapped by SHALSTAB as having moderate to high risk of instability were also removed.

In contrast, Alternative 4 has the greatest number of total acres (representing an aggregation of numerous small locations) mapped by the model to be at maximum risk for shallow-rapid landsliding. As discussed above, the logging would not cause more landslides. However the salvage of dead trees from areas that might become a landslide would result in less large wood entrained in landslides which could lead to landslides with more momentum that travel further and deliver more sediment and less wood into stream channels. Alternative 3 poses the least risk of this occurring of the action alternatives. Also, since Alternative 5 leaves substantial amounts of dead leave trees, its risk is also

considered low. As tree root reinforcement recovers in the next 15 years under the action alternatives, the extent (acreage) of ground at risk for shallow-rapid landsliding would gradually shrink and then stabilize to its pre-fire condition diminishing the differences among alternatives with respect to delivering wood within landslides.

Neither the construction of temporary spur roads (1.24 miles in Alternatives 2 and 3, about 2.2 miles in Alternative 6, and 2.3 miles in Alternative 4 and 6) nor the new construction and/or expansion of helicopter landings (4.5 acres in Alternatives 2, 3, and 4 and 3 acres in Alternative 6) would lead to any additional risks of causing mass wasting. These new construction areas are all located on stable, ridge-top ground where no risk of mass wasting occurs. Moreover, a mitigation measure is included with all action alternatives that requires erosion control measures such as sloping and water barring of these new construction sites following use, so that water would not be concentrated. This required mitigation in the timber sale contract (C6.6) negates any additional risk to mass wasting such construction might otherwise cause.

The no action alternative would result in normal landslide processes that occurs following stand replacement fire. All dead trees would be retained on all unstable area and such dead trees would be available to perform their beneficial functions in the riparian and aquatic ecosystems should landslides occur as a result of the fire coupled with weather conditions necessary to trigger landsliding.

Indirect Effects

The potential indirect effects on aquatic ecosystems from mass wasting with the Baked Apple alternatives has to do with the amount of fuel left following implementation of the alternatives and the effect those fuels could have on the size of future fires. Substantial levels of fuel left after the salvage is fully implemented (including after the slash treatments are complete) could feed a larger, more destructive fire in the future. If such a fire or fires were to occur and result in broader zones of tree mortality, they would have the indirect effect of leading to more shallow-rapid land slides—potentially resulting in both negative and beneficial effects to riparian and aquatic environments. Under a scenario of multiple landscape burns, sediment input from landslides could attain its upper range of natural variability and be several orders of magnitude above its ambient baseline level.

Implementation of Alternative 1, the no action Alternative, and to a lesser degree, Alternative 5 result in greater risk of leading to larger fires in the planning area compared to Alternatives 2, 3, 4, and 6 that all have a similar and somewhat lower risk of leading to large-scale future fires. The location of a worst case hypothetical fire start and worst case weather conditions (extreme fire weather was assumed) were held constant in order to model the size of such a fire after just one day of burning. In the year 2028, the FARSITE model (Finney 1998) predicted a 1,579 acre fire after the first burning period for Alternative 1 and an 823 acre for Alternative 5 after the first burning period. Alternatives 2, 3, 4 and 6 were predicted to vary between 599 acres and 692 acres under this modeled worst case scenario.

Implementation of the Baked Apple Alternatives also has the potential indirect effect of affecting conditions downstream in the North Umpqua River. Alternatives 1 and 3 present the lowest risk of having landslides that lack trees; therefore, they would result in the lowest risk of indirect effects to downstream beneficial uses from sedimentation associated with mass wasting. Alternative 4 has the most acreage included in the harvest

(but not traceable in the field) to be at maximum risk for shallow-rapid landsliding. In this case, if landslides occur there is a slightly higher potential for the effects of mass wasting in the planning area to express themselves downstream in the North Umpqua River with sediment delivery from landslides lacking wood. The downstream indirect effects associated with Alternatives 2, 5 and 6 all pose slightly more risk of downstream sediment delivery than Alternatives 1 and 3. In all cases, the BAER instream work done in Limpy and Bachelor mainstems and the tributary BAER treatments (Figure 63) all lower the risk of mass wasting actually affecting conditions in the North Umpqua River. The wood additions are expected to help stop or slow debris flows (Lancaster et al. 2001) and help store sediment from such flows, so that it is delivered at a more natural rate.

Cumulative Effects

There is a potential that Alternatives 1 and 5 could result in cumulative effects to aquatic systems from increased mass wasting. This cumulative effect may result from the reasonably foreseeable indirect effects of residual fuels leading to larger future fires causing more mass wasting in the vicinity of the planning area. Alternatives 2, 3, 4, and 6 could, also, result in such a cumulative effect but to a lesser degree.

This indirect effect associated with residual fuel loads may become cumulative when added to the existing and future effects of the 2002 Apple Fire on mass wasting, the 1987 Apple Fire, the past harvest history, and the ongoing effects of the road system with its undersized culverts and extensive ditch lines that could plug and divert water causing road and other hillslope failures.

The past activities that could add to cumulative effects are listed in Table 8 at the beginning of this chapter. The 2002 Apple fire burned a total of 8,835 acres in the planning area. This significant disturbance event is expected to add to cumulative watershed effects including mass wasting over the next two decades.

Of the 4,456 acres that were regeneration harvested from the 1950's through the 1980's, 2,384 acres did not stand replace. These acres, largely unaffected by the fire, are expected to contribute little to cumulative effects from mass wasting since the root strength is recovered, while the 2,072 acres of burned clearcuts from that era may contribute to cumulative effects of mass wasting if any unstable areas exist, especially since no large wood is available to be part of the potential slide material. The 380 acres that recently burned from the 624 acres of clearcut in the 1990's may contribute to cumulative effects from mass wasting for the next two decades (if unstable areas exist), while the acres regenerated in the 1990's that escaped the burning (244 acres) could contribute to the potential of mass wasting until the end of this decade. All of the clearcuts from the 1987 Apple Fire within the planning area were reburned in 2002, so the potential exists for cumulative effects from mass wasting from those areas if unstable areas exist, and they would not have large trees available to help mitigate the sedimentation from any landslides. Only a small fraction of the old clearcuts that have not yet recovered root strength or that burned in 2002 would potentially be prone to landslide contributions to cumulative effects because only a small fraction of the landscape exists as colluvial swales where landslides initiate.

All stand replacement areas were assessed in the SHALSTAB analysis. The potential for cumulative effects to aquatic systems from future landslides hinges on whether future fires actually escape during the period of concern (next 15-25 years) and whether any significant winter storms would occur to trigger additional mass wasting. If more

landslides occur from future events in the Panther basin and the face drainages in the planning area, their impacts could add to ongoing impacts of the 3 large channel impacting debris flows experienced in the Panther basin. These old debris flows still exhibit vertical stream banks and associated bank erosion.

The Apple Seed timber sale has no mass wasting potential and the 67 acres of hand-crew fuel treatments would provide no new risk to mass wasting cumulative effects since so few green trees would be cut. The 0.25 miles of temp road construction is on flat terrain where water routing would be mitigated following construction. No contribution to mass wasting cumulative effects anticipated.

None of the dozer lines, hand fire lines, or fire suppression construction points (Table 9) are expected to contribute to mass wasting cumulative effects due to the ridge-top nature of dozer lines and construction points and the limited size of hand lines. Moreover, all firelines and suppression construction points were rehabbed and water barred by October of 2002, so that water routing problems have been mitigated.

Counteracting these potential cumulative effects to the aquatic and riparian environments are the BAER channel treatments that were carried out immediately after the fire. These treatments added large wood to the tributaries channels of Panther, Limpy, and Fairy Creeks and mainstems of Limpy and Bachelor Creeks, plus the 1995 and 1997 Fairy Creek large wood additions. These projects have strengthened the natural functions of the sediment regime by potentially slowing or stopping debris avalanches and debris flows (Lancaster et.al. 2001), capturing and storing sediment from all sources, and metering out the stored sediment over time to downslope and downstream locations.

The road-related BAER work, which also occurred immediately following the fire in the fall of 2002 and the road work done during the summer of 2003 have also lessened risks that the existing roads would contribute to cumulative effects from mass wasting. Reasonably foreseeable road projects within the Baked Apple planning area, if implemented, may further reduce the potential risk of mass wasting associated with the road infrastructure. It is reasonably foreseeable that some road spurs would be decommissioned and numerous stream crossing culverts would be upgraded to pass flow during a 100-year storm event as recommended in the Baked Apple road analysis (USDA 2003a).

In addition, the reforestation with Apple Seed and other foreseeable reforestation efforts are expected to shorten the window of mass wasting risk due to accelerated rebuilding of root strength, provided the planting is successful.

Conclusions

Based on the above discussion, none of the Baked Apple alternatives would affect the sediment regime associated with the landslide process at the scale of either the 6th or the 5th-field watershed. No alternative is expected to degrade the watershed condition indicator of management-related landslides considered by NOAA Fisheries. In the longer term, alternatives that leave more residual fuels could extend the time-frames of accelerated mass wasting if large wildlife spread across Panther Creek and into the larger Middle North Umpqua watershed at some point in the future.

FLUVIAL EROSION

Affected Environment

Fluvial⁴⁴ erosion is addressed in Aquatic Conservation Strategy objective 3, which calls for the maintenance and restoration of conditions of stream shorelines, banks and bottom configurations, and Aquatic Conservation Strategy objective 9, which calls for the maintenance and restoration of habitat to support native populations. Streambank and streambed erosion can influence the above ACS objectives at the scale of a 5th field watershed.

Channel transport is the main mechanism that moves soil and nutrients from watersheds and is often accompanied by channel erosion. Although streambank cutting is primarily driven by encroachment of soil creep and other mass wasting processes with the effects of peak flows usually playing a lesser role, changes in the hillslope hydrology after a major disturbance such as the Apple Fire, can create conditions where peak flows become a major contributor to channel erosion and channel habitat impacts.

Previous harvest and stream cleanout⁴⁵ has augmented the effects of peak flows and increased channel scour throughout the planning area. Peak flow increases due to canopy removal by the 2002 wildfire will exacerbate fluvial erosion, and it is expected to continue for up to 40 years or until canopy closure is recovered across the landscape. Decreased evapotranspiration⁴⁶ leads to more saturated soil conditions that encourage channel formation in streams that rarely flowed water prior to the fire. These channels are susceptible to erosion as they are less likely to be armored with rock (Helvey et al, 1985). This process is already evident within the planning area (Hydrology Report, Project Record). Thirty-eight percent of Limpy Creek is at risk for peak flow increases and channel erosion followed by Bachelor Creek at 26%. These class IV tributaries are likely to experience bank sloughing and channel scour which is likely to degrade downstream habitat due to sedimentation and channel widening.

Large Woody Material

Large woody material (LWM) can have a profound effect on stream channel morphology and fluvial erosion processes. LWM can reduce stream velocities by interacting directly with the flow of water in the channel. By reducing water velocity, the shearing and erosive power of the water is reduced. This can be particularly important during high flow and bank full flow events. Large wood that falls into and is trapped in the channel can form jams and create areas of slack water that can act as sediment storage areas.

Post-fire Burned Area Emergency Response (BAER) funded the instream placement of large wood (Figure 64). One hundred and twenty-five logs were used along approximately 3.5 miles of Limpy and Bachelor Creeks (Table 54). Structures consist of a single log to complex multi-log jams. These structures were designed and placed in areas of the channel where constrictions would naturally capture large wood and in areas where large

⁴⁴ Fluvial erosion occurs as a result of flowing water which detaches and transports soil particles from one place to another.

⁴⁵ Stream cleanout was done during the decades of the 1960's through the 1980's where instream wood was removed in order to lessen potential impacts to culverts and bridges.

⁴⁶ Evapotranspiration occurs when live plants remove water from the soil and use it for growth. Excess moisture is transported to the leaves where it evaporates into the atmosphere. Plants, such as large trees, "pump" large amount of water out of the soil.

wood had been removed during past stream cleanout efforts. The structures were designed to capture, store and meter out sediments and gravels over time as well as capture additional large and small woody material migrating down stream. Fairy Creek has had approximately 80 pieces of large wood added to its channel in the early 1990's and lower Panther and Limpy Creeks had wood structures placed in the 1980's. LWM placed prior to the Apple Fire of 2002 survived the burn. Aquatic habitat diversity, from a large wood stand point, has been improved over pre-fire conditions. Beneficial sediment storage and routing within the stream channels are also improved.

Natural recruitment of LWM will increase with time in the burn area as burned late seral large trees near mainstem channels become available for recruitment to the stream and riparian area (Figure 65).

Apple Fire Stream Channels Treated With Large Wood Additions With BAER Funding

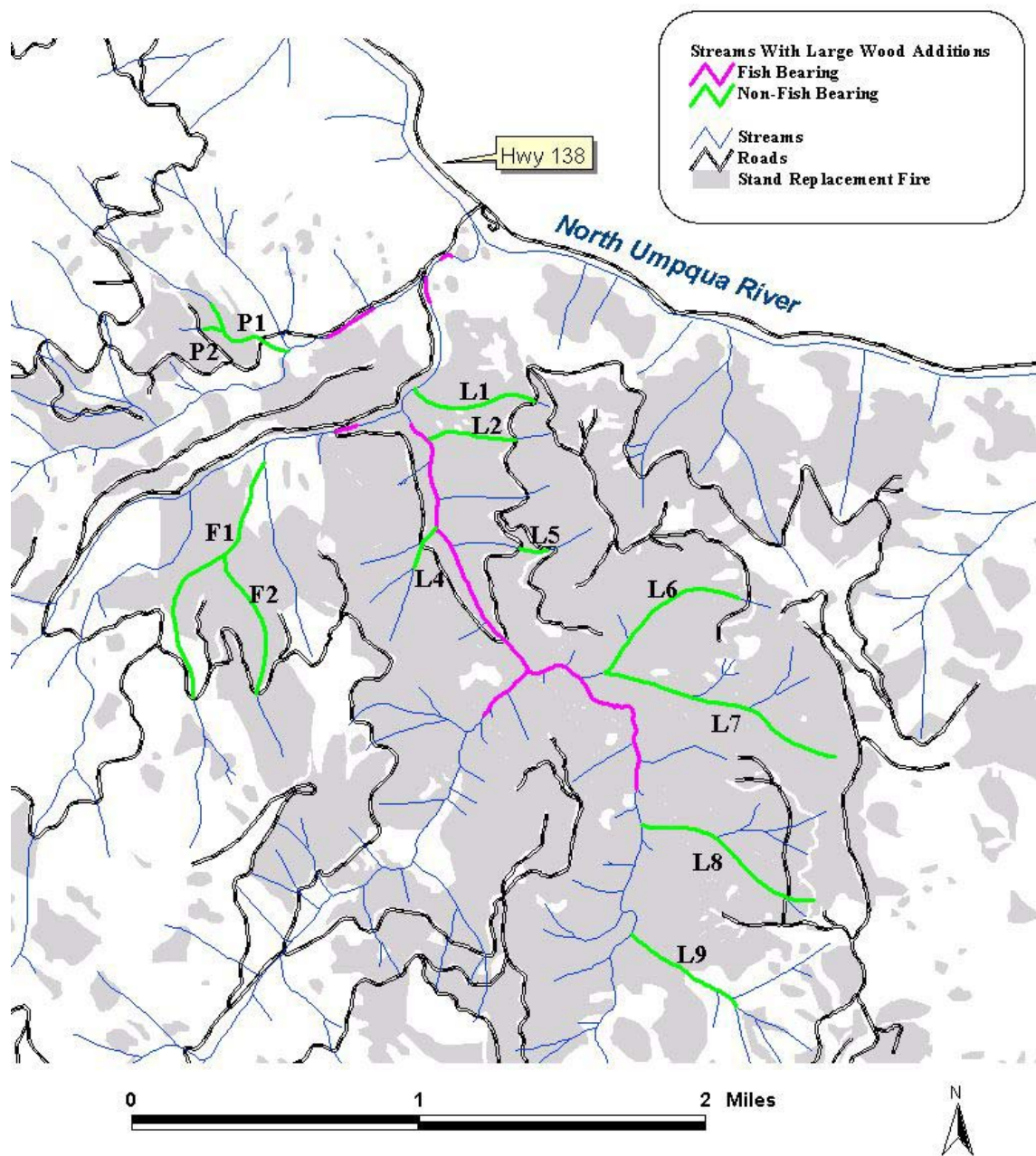


Figure 64. Channels treated with the addition of large wood during post-fire Burned Area Emergency Response (BAER) efforts. Note: Non-fish bearing tributaries are displayed alphanumerically where L=Limpy, F=Fairy and P=Panther.

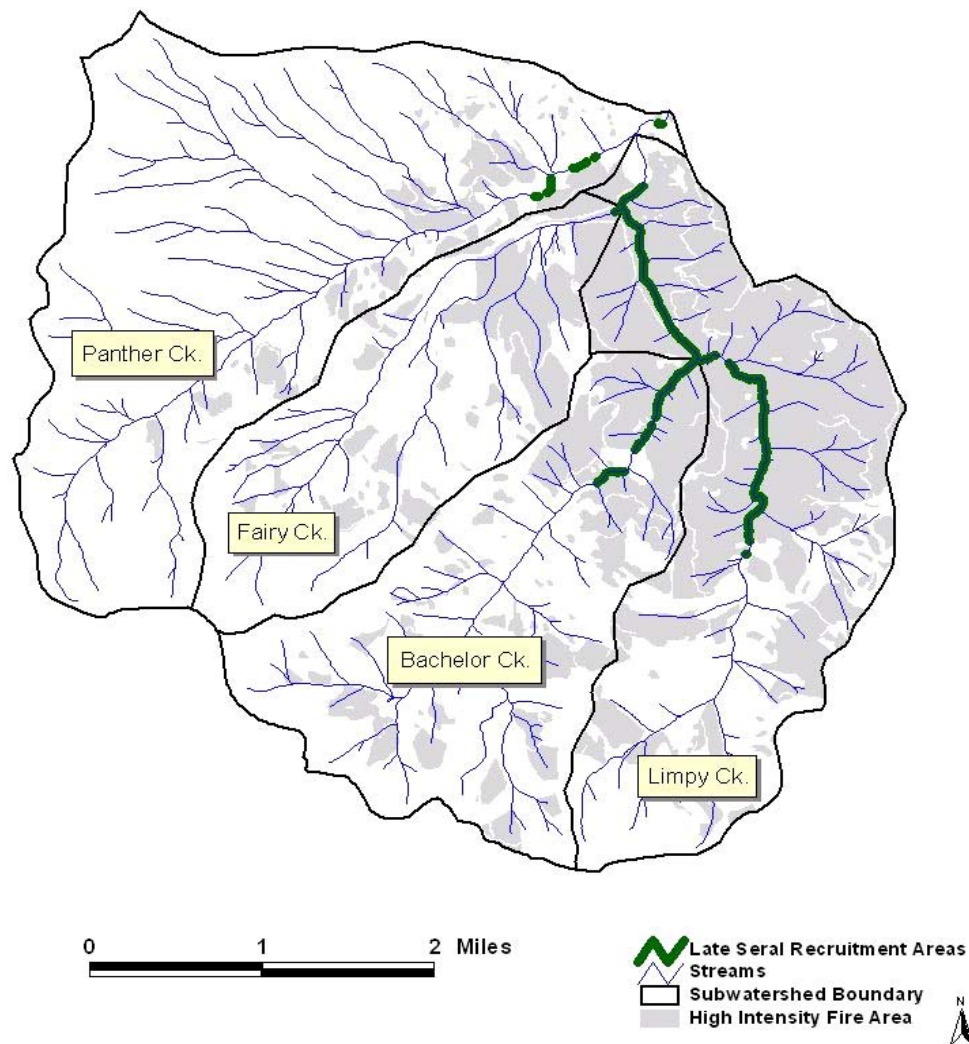


Figure 65. Riparian areas of late-successional forest that experienced stand replacement fire that are expected to provide recruitment into mainstem channels.

The post-fire wood placement, in concert with the anticipated natural recruitment from the fire, is expected to move Bachelor Creek and Limpy Creeks back within the natural range of variability for large wood within 5 to 10 years.

Table 54. Large wood recruitment due to BAER projects and future recruitment potential from burned late-seral riparian areas.

Main stem Reaches	Pieces of Large Wood added Post-Fire	Late-seral Stand Replacement Fire Adjacent to Creek (miles)
Bachelor	21	0.8
Fairy	10	0.1
Limpy	104	2.6
Panther	4	0.4

Some recruitment of wood into Panther Creek will occur as a result of the fire, providing some long overdue recruitment, however, only 0.4 miles of Panther Creek had late seral stand replacement fire next to the mainstem in the 2002 fire. Four pieces of large wood were added to the Panther Creek mainstem during post-fire rehabilitation using road equipment positioned on the road (Table 54).

The Apple Fire will do little to increase large wood recruitment into the mainstem of Fairy Creek because of the 0.9 miles of riparian forest that burned parallel to Fairy Creek, only 0.1 miles of late seral forest burned parallel to the creek that could recruit to help restore habitat and channel functions.

Large wood was also added to many of the tributary streams of Panther, Limpy, Fairy, and Bachelor Creeks (Figure 64). These tributaries are class III and IV⁴⁷ channels that experienced substantial amounts of stand replacement fire. Some tributaries were only partially burned and did not need additional wood added while others were in or adjacent to previous clear-cut harvest units and had no large wood available to add. Wood that was added to the tributary channels came from adjacent burned riparian areas. These burned trees were directionally felled into the stream with a chainsaw. Much of the preexisting wood in these reaches were completely incinerated or reduced in size to the point of being relatively ineffective. Clusters of trees added to the channels ranged from 1-10 pieces. Where possible, clusters of trees were placed in areas of natural sediment deposition. Due to the high gradient nature of these first and second order channels this was not always possible. Wood clusters felled in the tributary streams in the Panther Creek sub-watershed are slowing water velocities, capturing, storing, and metering sediment, and capturing additional wood. A total of approximately 4 miles of channel were treated on 12 tributaries of Panther, Fairy, and Limpy drainages (Figure 64).

⁴⁷ Class IV streams are intermittent, meaning that they do not run water year round.

Environmental Effects

Direct Effects

None of the Baked Apple action alternatives would result in any direct effects to aquatic systems from increased fluvial erosion. This is because none of the action alternatives would result in any peak flow increases that could cause increased fluvial erosion. Alternative 1 would also have no direct impact to fluvial erosion processes since no harvest of trees would occur.

Indirect Effects

Fluvial erosion may occur when fire-caused debris flows deposit into downstream areas such as the main stems of Limpy, Bachelor, Fairy and Panther Creeks. While only dead trees are being removed with the various action alternatives, these trees do provide mechanisms to slow the momentum of flows (Lancaster et al. 2001) and potentially keep flows from delivering to downstream areas. The delivery to downstream areas could result in indirect effects to aquatic organisms and the beneficial uses of water. Areas at high risk for shallow-rapid landslides identified by the SHALSTAB mapping and verified in the field were removed from harvest treatments in all action alternatives. In addition, areas of high to moderate risk of landslides (Table 53) were removed from any harvest in Alternative 3 further decreasing the risk of a shallow-rapid landslide occurring without the large wood component in that alternative. Although high risk areas were removed, Alternatives 2, 4, and 6 that have the most areas harvested would present the most risk of a landslide turning into a debris flow that lacked large wood. Such debris flows would potentially travel further downslope and contribute to fluvial erosion that occurs when winter flows cut through stream deposits and transport sediment downstream. Alternatives 3 and 5 would present less risk for an indirect effect while Alternative 1 would present no risk of such an indirect effect.

In the long-term, the replanting of the harvested units would result in a beneficial indirect effect to the stream ecosystem by hastening recovery of the stream morphology associated with live riparian vegetation that plays a role in counteracting fluvial erosion processes with stream bank root systems and wood input. All harvest units would be planted (Table 40), plus about 1,600 acres of adjacent or nearby burned plantations under all action alternatives. Alternative 4 would harvest the most units; therefore more acres would be replanted resulting in the most future benefit to recovering channel conditions as a result of hastened riparian regrowth and associated truncated timeframe for recruitment of wood into streams. Alternative 5 proposes the least harvest and replanting of the action alternatives, resulting in the least indirect benefits to aquatic systems due to channel recovery associated with hastened riparian re-growth. In the adjacent riparian areas of units in Alternative 5, no planting would occur further slowing the recovery role played by streamside trees.

While funds for reforestation would likely become available through various sources other than those generated as a result of the timber sale (known as KV funds), the amount and timing of when other planting money would become available is unknown. Salvage units would probably experience a minimum of a 3 to 5 year delay after the wildfire before reforestation occurs because planting would need to occur after the harvest and burning is completed. The planting of areas not proposed for harvest is on-going and dependant of the availability of funding.

Natural regeneration under Alternative 1 may take well over a decade to establish due to the severity of the wildfire and the lack of a natural seed source. Alternative 1 would result in no indirect beneficial effects to aquatic resources and beneficial uses because the natural riparian recovery time would not be shortened.

The fire will provide wood recruitment opportunities into stream channels in areas where late seral trees were killed near streams. This natural recruitment along with the large wood added during the post-fire rehabilitation activities will help ameliorate fire caused fluvial erosion by slowing streamflow velocity and increasing channel storage.

Cumulative Effects

Past actions described in Table 8 in the beginning of this chapter, such as riparian timber harvest and stream cleanout into the early 1980's, and riparian salvage following the 1897 Apple Fire, have together resulted in streams deficient of large wood and susceptible to fluvial erosion. The harvest of dead trees under the various action alternatives could possibly result in a cumulative effect if trees are removed from areas that may become landslides. If landslides occur in salvage areas not identified as unstable during the planning process then, in those instances, large wood would not be available in such future debris flows to function in helping slow, stop and store debris flow materials. Alternatives 2, 4, and 6 pose the most risk of such a cumulative effect occurring while Alternatives 3 and 5 pose less of a risk due to the fewer acres harvested and the way Alternative 3 was crafted using SHALSTAB maps to drop more areas of potentially unstable ground. Alternative 1 would have no risk of resulting in a cumulative effect since no salvage would occur.

Conclusions

Based on the above discussion, none of the Baked Apple alternatives are expected to cause any appreciable changes to the physical integrity of shorelines, banks and bottom configurations of streams or habitat for riparian dependant species due to fluvial erosion. This is true at the scale of both the 6th field and 5th field watersheds. The lack of any appreciable salvage in riparian areas and in unstable areas allows for the post-fire wood delivery processes to function. Large wood placement within the planning area's streams, accomplished in 2002 during Burned Area Emergency Rehabilitation, jump-started the wood recruitment process to help alleviate impacts to shorelines, banks and bottom configurations associated with the fire's effect on fluvial erosion.

SURFACE EROSION

Affected Environment

The influence of the alternatives on the surface erosion process is the second indicator that is highlighted and tracked through this analysis in order to assess and measure the effects of the alternatives on erosion and sedimentation, identified as a significant issue during scoping. This particular aspect of the erosion process was chosen as an indicator of the erosion and sediment issue, along with mass wasting, because the proposed salvage would have more influence on these aspects of erosion and sedimentation than the other forms of erosion and sedimentation assessed in this analysis.

The planning area was mapped according to erosion hazard classes (low, moderate, and high) as required in Forest Plan standards and guidelines. Thirty-three percent of the planning area has high erosion hazard and 66% has been mapped as either moderate or low erosion hazard (Figure 54). The erosion hazard map gives a board scale picture of surface erosion potential.

Surface erosion begins immediately following a fire and drops off dramatically as ground vegetation re-establishes itself within 3 to 4 years (Emerson 2003; Elliot et al. 2001). The amount of displaced soil from surface erosion that becomes sediment in live stream systems is substantially less than can be expected from landslides. Surface erosion is the wearing away of soil from one point on the earth's surface to another. Accelerated erosion is defined as a rate of loss in excess of natural rates usually attributed to human-caused activities.

The surface erosion process exhibits a broad range of natural variability within steep forested landscapes of the planning area. Significant disturbance events like the 2002 Apple Fire play a large role in establishing the upper end of the range of natural variability for surface erosion. The Apple Fire burned much like the previous stand replacement fire in this landscape (USDA 2001). Extreme winter storm events within the first year following such a stand replacement fire would also factor into establishing the upper end of the range. Accelerated surface erosion is usually associated with increases in overland flow that results from decreases in water infiltration of the soil (Helvey 1980 as cited by McIver and Starr 2000). Limited infiltration is generally caused by fire-induced water repellency of the soil, called hydrophobic soil (McIver and Starr 2000), which is related to very high soil burn severity. Field verification of all proposed salvage units revealed only small, scattered locations of soil with hydrophobic characteristics. Therefore, little to no overland flow of rainwater is expected within the planning area. Informal, ocular monitoring of turbidity levels in Limpy and Panther Creeks following rainstorms during the winters of 2002/03 and 2003/04 showed very low to unobservable levels of turbidity in these creeks. Though neither of these winters produced substantial rain-on-snow events, these observations validate that surface erosion is not expected to be the major process contributing sediment to streams. As such, the level of concern over the possibility that large quantities of surface erosion could be delivered to stream systems is relatively low.

Following fire, surface erosion typically occurs as dry ravel (sloughing of soil, rock, and organic debris) immediately after a fire or during the first winter when rain splashes directly on unprotected soil causing soil particles to dislodge and deposit downslope. The first winter following the Apple Fire was relatively gentle with no rain-on-snow storm events. Field observations revealed incidences of surface erosion but sedimentation associated with surface erosion appeared to be minimal. The largest risk of sedimentation from surface erosion from the fire has already passed.

Most all of the surface erosion following slash burns in an Oregon coast range study on the Siuslaw National Forest occurred over the first year following the prescribed fire with 65% of that yearly amount displaced within 24 hours of the burn (Bennett 1982). In this study, clearcut and burned slopes less than 60% slope gradient had one-eighth the surface erosion of slopes greater than 60%, and unburned clearcuts on slopes greater than 60% produced one-tenth of the surface erosion compared to slopes that were burned.

The litter layer on the soil surface plays an important role in controlling surface erosion. It also retains ample amounts of water and thereby controls the rate at which rainwater reaches the soil surface (Martin and Moody 2001). Further, the well-developed structure

of many forest soils promotes rapid infiltration of rain water into the soil. Thus, overland flow of water during heavy rainstorms is rare in undisturbed forest soils.

Though the 2002 Apple Fire did not result in any substantial levels or locations of hydrophobic soil conditions, the fire did remove much of the protective litter layer. This litter loss is expected to result in elevated rates of erosion from the hillslopes with some degree of delivery into streams. The A horizon (top soil layer) ranges from 4 to 10 inches in depth for the soils associated with proposed activities. Post-fire average surface erosion was modeled at 1/8 inch loss from the A horizon. Surface erosion losses due to the fire are estimated to range from less than 1/16 inch in some units to almost 2 inches in others. Documented signs of post-fire erosion such as pedestal⁴⁸ formations from sheet erosion are most evident in units: 45A, 45B, 45C, and 48.

Surface erosion and its associated sedimentation of streams would likely follow the same short-term trend as reported in a study conducted in Eastern Oregon by Robichaud and Brown (1999). These authors reported that following fire, surface erosion rates averaged 17 tons per acre but this immediate spike in surface erosion dropped off by 94%, down to 1.02 tons per acre the second year and down 97% to 0.45 tons per acre the third year. A similar trend is expected in the planning area provided that rainfall rates remain at average levels. The degree of surface erosion over the next few years would depend on winter rain intensities, localized burn severity, amount of ground cover, and the speed of vegetation regrowth.

Standards and Guidelines in the Umpqua National Forest LRMP require a minimum amount of effective ground cover to be in place within the first year following a ground disturbing activity such as timber harvest (LRMP IV-68). Since proposed salvage is focused on the steep terrain of stand-replacement fire with high erosion hazard, the highest level of minimum ground cover listed under this Standard and Guideline (85% effective ground cover) has been established as the requirement for this project. This highest level of effective ground cover is most effective at lessening risk of surface erosion.

Although stand replacement mortality has occurred across a substantial portion of the planning area not all ground cover has been lost. In areas where trees were killed but where the needles were not consumed by the fire, dead needles and small branches have fallen to the ground and have helped to buffer exposed soils from erosion. Field observations indicate this needle cast has reduced most of surface erosion compared to areas devoid of needle cast where soil pedestals can be observed in some places. The proposed salvage units considered in this EIS that currently have less than 85% effective ground cover prior to harvest are: 9B, 15, 19, 25A, 25B, 39, 40, 43, 44, 45A, 45B, 45C, 48A, 48B, 57, 58C, 59A, 59B, 62A, 62B, 62C, 62D, 66, 68, 69, 72, 73, 74A, 74B, 75, 76, 77, 78A, 78C, 78D, 78E, 78F, 79A, 79B, 87, 88A, 88B and 89.

The Water Erosion Prediction Program, WEPP (Elliot and Hall 1997) was used to assist in alternative development and to estimate the rates of potential surface erosion for the proposed harvest units. The WEPP model provides estimates of erosion and sediment based on amount of effective ground cover, precipitation, soil texture, landscape condition and topography. These factors were evaluated within the proposed harvest units, as well as the buffer between the unit and stream. The pre-fire condition was also modeled but with 100% effective ground cover and older stand ages. Under the modeled

⁴⁸ Soil pedestals form through erosion as a column of un-eroded soil becomes surrounded by space once occupied by soil that eroded away. Pedestals form under the protection provided by a small stone or pebble that sheds rain allowing the formation of the pedestals.

pre-fire condition, very little surface soil losses were predicted, which is consistent with the above cited studies done on surface erosion. In fact, the average pre-fire erosion and sediment rate was modeled as only 1% of the average post-fire rates of surface erosion during the first winter following the Apple Fire. These modeled results are consistent with the Oregon coast range study discussed above (Bennett 1982). The undisturbed, unburned scenario modeled with the highest rainfall levels (precipitation of 68 inches or a 30 year event), produced only 18% of the surface erosion or sediment produced from the modeled lowest rainfall event (precipitation of 45 inches or a 1.5 year event) under a burned scenario.

Environmental Effects

Direct Effects

A broad-scale overview of the alternatives with respect to their potential to cause additional surface erosion following the fire is provided by comparing the amount of acreage proposed for salvage in the high erosion hazard class for each alternative. All action alternatives harvest disproportionately more area in the high hazard area compared to the amount of high hazard land in the planning area (Table 33). This is because fire is more likely to burn as a stand-replacement event on the steepest slopes, and slope steepness was a major factor used to develop the hazard classes. In general, Alternative 4 salvages the most acreage in the high erosion hazard class followed by Alternatives 2, 6, 3, and 5 which harvest progressively less. Alternative 1 would salvage nothing in the high erosion hazard ground. In general, the alternatives with the most harvest and treatment in the high erosion hazard ground pose the greatest risk of surface erosion.

If harvest occurs under this proposal, the earliest it would take place would be during the fall of 2004 with most harvest occurring in 2005 when surface erosion from the fire will have substantially waned. What remains of the surface erosion potential from the fire along with new surface erosion from the logging would be mitigated in harvest units by the retention of harvest slash to function as effective ground cover. Bennett (1982) found that debris scattered across clearcut and slash-burned study slopes helped arrest surface erosion and McIver and Starr (2000) reported that logging litter reduced soil loss in post-fire watersheds.

The levels of effective ground cover within the salvage units immediately following implementation of the alternatives, including slash burning, are used as a measure of the relative differences among alternatives with respect to the potential risk of surface erosion that could occur as a result of salvaging dead trees and treating the slash (Table 55). The level of effective ground cover was selected as an indicator to help track how the various alternatives respond to the erosion and sedimentation issue and to help assess the differences among alternatives with respect to this significant issue.

The effective ground cover that existed within proposed salvage units during the fall and winter months immediately following the 2002 Apple fire varies by alternative (Table 55).

Table 55. Levels of effective ground cover (in the form of logging slash only) by alternative. This Table does not display the effective ground cover present in the proposed salvage units that exists as herbaceous vegetative regrowth after the fire.

Alternative	Acres proposed for harvest	Acres with less than 85% EGC immediately after the fire	Acres with less than 85% EGC post-implementation	Percentage of acres left with less than 85% Effective Ground Cover after harvest activities
Alt 2	1,075	576	282	31%
Alt 3	880	515	236	36%
Alt 4	1,257	582	416	27%
Alt 5	435	110	99	13%
Alt 6	917	476	227	31%

For instance, in Alternative 2, there were 645 acres with less than 85% effective ground cover as a result of the 2002 Apple Fire's consumption of forest floor duff. By the spring of 2004, essentially all proposed harvest units have regained a large amount of effective ground cover in the form of pioneering vegetation (moss, grasses, and herbaceous vegetation). Salvage logging will set back the recovery of vegetative regrowth as logs are dragged during yarding, especially in skyline logging corridors and in areas of ground based skidding. Slash burning will also set back the recovery of the pioneering vegetation, especially in areas that are underburned (broadcast burned). Site preparation, logging systems and the building and subsequent decommissioning of temporary roads all can influence the surface erosion process, and the degree of these activities varies by alternative (Chapter 2, Table 6). In general, ground-based skidding (referred to as loader logging in Table 6) causes the greatest immediate soil effect, followed by skyline and helicopter logging (Klock 1975, as cited by McIver and Starr 2000).

The largest potential setback in vegetation succession and its role in effective ground cover is associated with broadcast burning. This is addressed by the application of mitigation measures incorporated into all action alternatives:

1. Inventories will be conducted before fuels treatments where less than 85% EGC was found immediately following the fire, in areas of severe regeneration limitations (TES), and in areas of severe burn effects in order to determine if slash treatment is needed and to determine if there is a need to mitigate EGC with seeding or straw mulch. In these areas, no slash treatment using fire will occur if post-harvest EGC in the form of logging slash is less than 85% and fuel loading is less than 25 tons per acre. Also in these areas, slash treatment will be 'lop and scatter' where fuel loading is greater than 25 tons per acre.
2. Seed from native plants, and/or straw will be applied to increase ground cover in any units (regardless of the above designation) that does not meet effective ground cover within the first year following harvest.

Logging slash will add effective ground cover, and in most cases it is expected to replace live vegetation as effective ground cover in locations that would be underburned. The underburning would occur during moist weather conditions when only partial consumption of logging slash would occur leaving the remainder to function as EGC. The predicted contribution of logging slash to EGC varies by alternative (Table 55). Based on the site

preparation mitigation measure listed above, a varying number of acres may need additional ground cover added in the form of seeding or straw mulch.

Some salvage units have high surface rock and lower surface soil content and thus have experienced slower rates of herbaceous vegetative recovery. The high surface rock content in such units functions as effective ground cover, so the delayed vegetative recovery prior to salvage activities is not expected to lead to significant levels of new surface erosion associated with the salvage operations in these units. The cover provided by the high surface rock content is expected to minimize surface erosion.

Under Alternatives 2, 3, 5, and 6 any surface erosion caused by the logging and site preparation must travel through untreated riparian reserves in order to reach streams. Field observations during the spring of 2004 showed that riparian areas have substantial levels of the recovering herbaceous vegetation and sprouting hardwoods to function as ground cover to help arrest the gravity driven and rain driven movement of surface erosion before it enters streams.

Alternative 4 would apply a small amount of harvest (32 acres) and fuel treatments (202 acres) within the riparian reserves adjacent to most harvest units. The associated disturbance within these buffers caused by these activities is expected to result in some soil disturbance and a loss of some ground cover within the recovering burned riparian areas. This is expected to be offset somewhat in Alternative 4 however, by the effective ground cover, in the form of logging slash that would be added by the salvage operation.

Also mitigating the delivery of sediment to downstream perennial streams are the BAER channel treatments located in many of the burned intermittent tributary channels. The addition of log clusters throughout the length of many burned tributary channels will function to capture, store, and meter out the sediment transport to downstream areas over time.

The detailed analysis of all proposed salvage units in terms of the potential sediment delivery from surface erosion using the Water Erosion Prediction Program (WEPP) varies by alternative (Figure 66). These predictions are believed to represent a worst case scenario in terms of the tons presented in the Figure. It is based on a 1.5-year rain event, which was the amount of rain experienced during the winter 2002-2003.

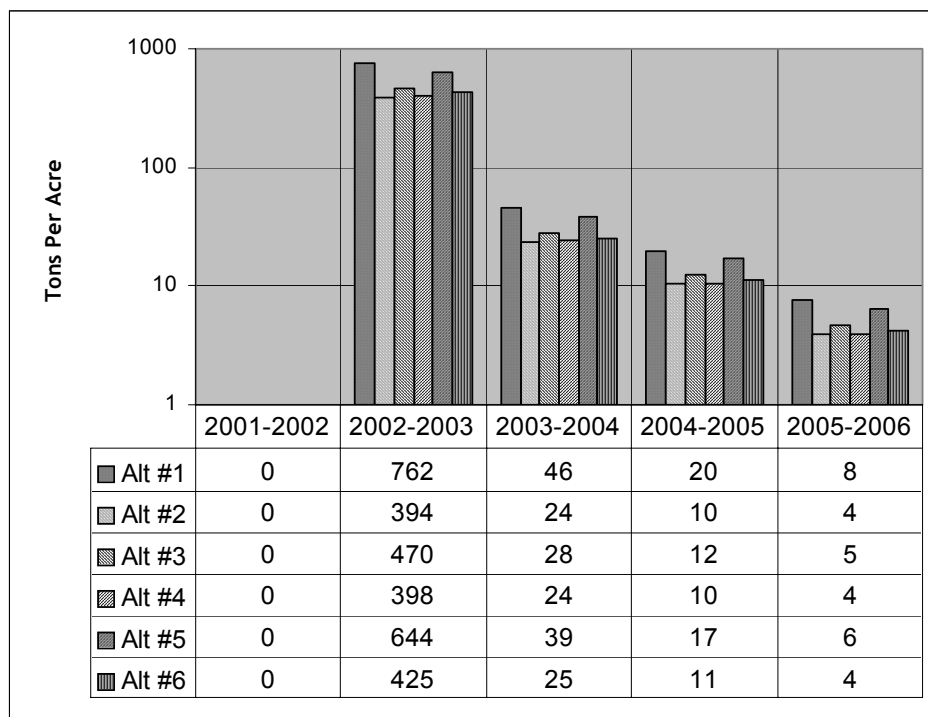


Figure 66. Estimates of tons of sediment generated from surface erosion for 2001 through 2006. Estimates are based on rain-years equivalent to 2002-2003 (1.5 year-rain event or 45 inches of rain for the year). If more extreme weather were to occur, then the tons of sediment from surface erosion would be higher, but the relative differences among alternatives would remain similar.

The rapid decline in surface erosion rates found by Robichaud and Brown (1999) were used to develop Figure 66, which displays how effective ground cover, recovering ground vegetation, and associated sediment decreases following fire. The 2004-2005 column on the timeline represents when alternative implementation is predicted to take place. These histograms represent the effects of the alternatives added to the effects of the fire. Based on Figure 66, Alternatives 2, 3, 4 and 6 would have the direct beneficial effect of reducing sediment from surface erosion compared to the no action alternative. This is due to increased levels of effective ground cover generated by harvest and retained during site preparation.

Site preparation, logging systems and the building and subsequent decommissioning of temporary roads associated with the action alternatives all can influence the surface erosion process (Table 6, Chapter 2). In general, ground-based skidding causes the greatest immediate soil effect, followed by skyline and helicopter (Klock 1975, as cited by McIver and Starr 2000).

The activities in Table 6 would expose some areas of soil to surface erosion from rainfall. Surface erosion and associated sedimentation are anticipated to be short-term and localized. For the handpile burning displayed in Table 6, the localized erosion would not lead to sedimentation because it would be mitigated by the surrounding effective ground cover that would continue to exist between burned handpiles and any stream channels. Broadcast burning would pose more risk of ground cover losses and surface erosion than handpile burning, however, the risk of erosion and its potential to generate sediment due

to broadcast burning was mitigated in the development of burning prescriptions. All broadcast burning would be implemented when fuels are moist so that fuel consumption would not be complete in order to maintain adequate levels of unburned slash to function as effective ground cover. Additionally, effective ground cover would be monitored immediately following the broadcast burning of individual units to assess whether prescriptions for effective ground cover are being met and to assure that any adaptations to the burning prescriptions can be made, if needed. Based on the combination of mitigation and monitoring, broadcast burn treatments are not significantly increase surface erosion.

An increase of erosion can occur when skyline and loader harvest are concentrated within yarding corridors. Best Management Practices included in all action alternatives require erosion control measures be in place before the beginning of the rainy season to reduce the transport of erosion.

Most of loader logging would occur on existing roads or on new temporary roads. Proposed loader operations would be held to less than 10% detrimental conditions by spacing loader trails 100 feet apart and mitigated by meeting at least 85% effective ground cover following logging. Seven units included in some of the action alternatives (units 4, 15, 42, 48B, 59A, 75, and a portion of 27A) would require loader logging where equipment would operate away from existing roads. Loader operations would be held to less than 10% detrimental conditions by spacing loader trails 100 feet apart and mitigated by meeting at least 85% effective ground cover following logging. Monitoring of the 1996 Lakeview and 2003 Downbeat Timber Sales on the Diamond Lake Ranger District has shown this practice to create an estimated 8%-10% detrimental soil conditions within harvest units. A mitigation measure incorporated into Alternative 2 and 6 requires that all equipment piling of slash would be restricted to loader trails, and existing permanent and temporary roads. None of the loader logging associated with any action alternative would result in a cumulative total amount of detrimental soil conditions over the 20% threshold required in the Standards and Guidelines of the Forest Plan (Table 35). The surface area occupied by loader trails is accounted for in the cumulative detrimental soil condition by alternative displayed earlier in this chapter (Table 35) under the heading of Site Productivity. The loader harvesting sites located off of existing roads would all be done on low to moderate erosion risk class ground, and where increased compaction is not expected to occur.

Anticipated disturbance of the ground and herbaceous vegetation from skyline harvest is expected to leave 5% of the proposed activity area in short-term detrimental conditions (Soils Report, Project Record).

The effects of temporary roads, which would be either reused or constructed (Table 6) and subsequently decommissioned, are expected in the short-term. This is based on field observations that revealed no signs of compaction based on no difference in soil structure or strength within temporary roads following decommissioning (Soils Report, Project Record). This lack of noticeable compaction is related to the shallow soil depth on the ridge top landforms where temporary roads would be built and the natural mitigation of frost heave from soil temperature swings on these landforms. These roads would be either scarified or subsoiled depending upon the soil depth and they would have slash covering the treated surface. This mitigation increases water infiltration, incorporation of

organic matter into the soil profile, and improved tilth⁴⁹. Since some of these temporary roads from previous harvest activities were not properly decommissioned after use, their decommissioning following this project would result an overall reduction in detrimental soil conditions.

Indirect Effects

The potential indirect effects to aquatic ecosystems from sedimentation associated with the alternatives has to do with the amount of fuel left following implementation of the alternatives and the effect those fuels could have on the size and severity of future fires. Post-fire logging is expected to increase short-term fuel loads and the fire risk due to increased fine fuel beds of logging slash. These fine fuels are planned to be reduced through site preparation, which would occur between 2005-2008. Plus, the fine fuels would decay with time also diminishing this short-term risk. The salvage logging would decrease the intermediate and long-term fire risk of future fires due to the removal of large dead structure. Fuel build-up following the 2002 fire is predicted to start becoming more of a risk beginning in about 25 years. Residual fuels could cause a future fire to burn hotter and cover a larger area leading to more surface erosion and resultant sedimentation. The alternatives that harvest and treat the least acreage result in more residual fuel and more potential for such an indirect effect.

Implementation of Alternative 1, the no action Alternative, and to a lesser degree, Alternative 5 both result in more risk of leading to larger fires in the planning area compared to Alternatives 2, 3, 4, and 6 that all have a similar and somewhat lower risk of leading to future, large-scale fires. In the year 2028, the FARSITE model (Finney 1998) predicted a 1,579 acre fire after the first burning period for Alternative 1 and an 823 acre fire for Alternative 5. Alternatives 2, 3, 4 and 6 were predicted to be similar to one another and vary between 599 acres and 692 acres under this modeled worst case scenario.

Along with the risk of experiencing larger future fires, such fires would potentially burn hotter due to the residual fuels left behind after the Apple Fire. After 25 years, large residual fuel remaining after the 2002 fire like tree boles and tree tops that have fragmented and fallen to the forest floor would increase the length of time a future fire would burn on the forest floor. Extended fire residence time on the forest floor results in higher levels of soil burn severity, which in turn is a factor that could lead to increased surface erosion and sedimentation of planning area streams.

This indirect effect associated with residual fuels may be most pronounced in some of the riparian reserves in steep terrain where large fuels tend to accumulate when falling woody material migrates into the concavities of stream bottoms. The effects of surface erosion and sedimentation associated with any future reburning of riparian reserves are expected to be the least in the alternatives that harvest more of the dead trees. Though Alternatives 1, 2, 3, 5, and 6 all avoid harvest in riparian reserves, those that retain more leave trees or that harvest the fewest upland acres, (Alternatives 1, 3 and 5) would tend to eventually contribute more fuel to downslope riparian reserves and increase the risk of indirect effects from future riparian reserve reburns. Alternative 4 would probably pose the least amount of risk from such an indirect effect since it retains minimal amounts of dead leave trees.

⁴⁹ Tilth is the physical condition of a soil related to its ability to allow seedling emergence and root penetration.

In order to trigger any of these future indirect effects, a fire would have to get started and initial attack would have to be unsuccessful such that a fire escapes. This would depend largely on future weather conditions at the time when the elevated risks exist, and the staffing, techniques, and budgets available to suppress fires in the future.

Cumulative Effects

The surface erosion and sedimentation associated with the salvage logging, slash burning, temporary road construction, and landing construction detailed in Table 6 for the Baked Apple action alternatives have the potential of resulting in cumulative effects to the aquatic environment at the scale of the 6th field watershed when added to the potential sedimentation associated with the past clearcut acres that burned in the 2002 Apple fire. Of the 5,080 acres previously clearcut harvested in the watershed, 2,453 acres of these old clearcuts burned in the 2002 Apple Fire (Table 8). Also, the 241 areas of salvage following the 1987 Apple Fire, all reburned in the 2002 Apple Fire. The potential exists for cumulative effects from additional surface erosion and sedimentation in these areas since they lack any mitigating overstory trees and large wood.

The recent fire suppression activities associated with the 2002 Apple fire and subsequent BAER activities (Table 9 at the beginning of this chapter) may also play a role in surface erosion cumulative effects. All of the firelines including the 10.2 miles of dozer line and 1 mile of hand lines were rehabilitated with duff pull-back and water barred by October of 2002. Hand lines present little chance of generating erosion and dozer lines were built on ridgetop locations where surface erosion is limited. These rehabilitated fire lines are expected to contribute little to sedimentation or cumulative effects. The various constructed points made during the suppression efforts equated to surface soil disturbance of about 3.4 acres which was rehabilitated by October of 2002. Since these areas were constructed on gentle to flat ground, they would contribute little to surface erosion cumulative effects. The recent reforestation of 286 acres during February of 2003 on hill slopes and adjacent riparian areas including the planting of about 75 feet on either side of the lower 3 miles of Limpy Creek is expected to help offset surface erosion and sediment delivery, lessening overall potential of cumulative effects of sedimentation from surface erosion.

Reasonably foreseeable actions in the planning area (Table 10 at the beginning of this chapter) can also contribute to cumulative effects from surface erosion. The logging and temporary road construction associated with the harvest of 45 acres in the Apple Seed Stand Improvement Project would result in limited amounts of sediment from surface erosion that could contribute to surface erosion cumulative effects. The foreseeable reforestation and road maintenance activities would both result in lessening the risks of additional surface erosion in the planning area.

The potential for any of the action alternatives to cause a significant cumulative effect from surface erosion is considered to be low because the combination of vegetative regrowth and the logging slash left after implementation would minimize the effects of both erosion and sedimentation from the soil disturbed during logging and site preparation. The action alternatives would leave materials of a size class that is less likely to be consumed quickly through decomposition or wildfire. In addition, all action alternatives would reforest all harvest units and the adjacent riparian reserves with the exception of Alternative 5. The reforestation is expected to decrease the amount of time needed to reach natural background sedimentation rates. The expected slower recovery

of conifers in the riparian reserves under Alternative 5 would increase the length of time conifer vegetation would be available for arresting surface erosion.

Conclusions

Based on the above discussion, none of the Baked Apple alternatives would affect the sediment regime associated with the surface erosion process at the scale of the 5th field watershed over the time-frame of decades or longer. The various action alternatives would cause short-term adverse effects on the surface erosion process due to disturbance of recovering post-fire vegetation from logging and slash burning, yet this impact is not expected to last any longer than a few years. The salvage activities, including slash burning, are not expected to cause any appreciable change to the sediment regime from surface erosion over the long-term since vegetative recovery in the form of pioneering ground cover (moss, grasses, and sprouting hardwoods) recovers quickly to hold surface soils in place.

ROAD-RELATED EROSION AND SEDIMENTATION

Affected Environment

Road networks in many upland areas of the Pacific Northwest are the most important source of management-accelerated delivery of sediment to anadromous fish habitats (FEMAT 1993). Road-related sediment can come as large pulses during major winter storm events such as occurred in 1955, 1964, and 1996. These infrequent high intensity storms cause water to back up behind undersized stream crossings that can fail and deliver the surrounding fill material directly to the stream or divert water out of channels and on to roads ultimately leading to all forms of erosion (discussed above in this Chapter). Such storms can also overwhelm the ditch lines and cross drains in a road system causing water to route to locations where it normally would not be, resulting in more erosion and sedimentation of streams.

Road-related sediment delivery can also occur with timber sale log haul on gravel and native surface roads during wet periods if haul is allowed to proceed in wet conditions. Road maintenance or upgrades done to prepare roads for timber haul is another potential source of sedimentation from newly disturbed ditch lines or newly reconstructed sites that can deliver sediment directly to streams during the first couple of winters following the work. Finally, minor amounts of sedimentation can occur from the dust that is generated during dry season haul on gravel and native surface roads that parallel streams, if dust abatement is ineffective.

Fire-Related Road Work

Following the Apple Fire, emergency road repairs were carried out under the Burned Area Emergency Response (BAER) program that provides money to rapidly prepare for the aftermath of fire effects. BAER road work was conducted to protect resources and prevent road damage during the fall of 2002 prior to the onset of winter rains. Most of the BAER work conducted to improve road drainage was done on roads 4720 and 4720-005 where the major fire effects occurred. Work to reduce the risk of stream crossing failures

occurred on six sites where grade sags⁵⁰ were installed in the road to eliminate diversion potential. Another stream crossing culvert had a slotted riser⁵¹ installed to reduce risk associated with inlet plugging.

In addition to the work on stream crossings, BAER work also included removing unstable side cast fills⁵² at fourteen locations. The total amount of unstable material removed was about 3,200 cubic yards (about 320 dump truck loads). Most locations posed some risk for mass wasting of road fills that would result in sediment delivery to streams. The focus of this BAER road work was on the more obvious and imminently failing sites. Most, if not all sites with significant risk on both the 4720 and 4720-005 roads were treated; little additional need exists for fill removal on those roads (Road Engineer Report, Project Record).

BAER work also included road drainage maintenance work to prevent sediment delivery. Drainage work was focused on roads 4720 and 4720-005, where the Apple Fire had the greatest effect, and all needed work was completed. Ditch relief and stream crossing culvert inlets were cleaned of material restricting inflow, ditches were cleaned of sediment and debris that could impede or divert flow from reaching culvert inlets, and road bed surfaces were graded to eliminate rutting and the associated risk of excess flow down road surfaces that could bypass flowing into cross drains. One winter after the Apple Fire, very little new drainage maintenance needs have since been identified during field reconnaissance of the road system in the planning area.

Finally, during BAER work on the 0.4 mile 4720-510 road, all the culverts were removed, the ditch was filled, and the road was out sloped to eliminate all drainage-related problems and reduce risk of mass wasting.

Additional funding was made available to conduct further road maintenance in the Apple Fire area during the summer of 2003, which included work on roads that would be used if any of the action alternatives were implemented. Approximately 75 ditch relief culverts were installed on roads 4720 and 4720-005. Most of these installations replaced existing ditch relief culverts. The replacements are expected to result in reduce road-related erosion. This is because the new culvert outlets were located at or below the toe of existing fill slopes, whereas many of the old culverts were not installed as deep in the roadbed and discharged directly onto fill slopes, which were more subject to erosion. Many of the replaced culverts were deteriorated to the point of leakage, causing internal erosion of the fill. Prior to replacement, the potential sediment delivery from the old culverts was probably minimal, however as most replacement locations were located well away from streams, and most sediment discharge from the old culverts would have likely filtered out on the hill slopes before entering streams. This work was accomplished primarily to improve road functioning in the aftermath of the fire which will help the transportation system sustain itself following the fire as well as to lessen the impacts of the road systems on erosional processes.

Approximately five of the new culvert installations on the 4720-005 were additional culverts placed in locations where no culvert previously existed. These were installed at locations to reduce the length of ditch that flows directly into stream crossings.

⁵⁰ Grade sags are constructed by excavating a low point across the roadbed to capture any stream flow that does not pass through the culvert, and route the water back into the stream.

⁵¹ A slotted riser is a cylindrical pipe with slots cut in it, installed vertically on top of a culvert inlet.

⁵² Side cast fills consist of material placed (filled) on a slope to make part of the road structure. These fills are sometimes unstable if placed on steep slopes or if logs or slash were buried in the fill at the time of construction.

Both the 2002 BEAR road work and the 2003 road maintenance targeted at the Apple Fire area has and will continue to result in some reduction of sediment delivery compared to post-fire conditions prior to the completion of this work.

Existing Condition of Stream Crossings

A road management Standard and Guideline in the Northwest Forest Plan requires an assessment of each road's influence on the Aquatic Conservation Strategy objectives (ROD C-32). This requirement was accomplished with a Roads Analysis done for the Baked Apple project (USDA 2003a). A total of 173 stream crossings were inventoried in the Baked Apple planning area in order to provide data for the roads analysis following completion of the BAER road work. The inventory comprehensively covered the Baked Apple analysis area to assess relative risk of sediment delivery due to crossing failures during peak flow events as required in the above Standard and Guideline. Another road management Standard and Guideline calls for the improvement of stream crossings that pose a substantial risk to riparian resources so that such crossings accommodate at least a 100-year flood (ROD C-33). Those segments of roads within the planning area with crossings that stand to deliver large quantities of sediment as a result of possible failure were assigned a higher priority in the Baked Apple Roads Analysis for such improvement.

Stream crossing failures occur when not all water and stream borne debris is able to pass through a culvert or other crossing structure, as designed. Depending on the configuration of the structure and the road grade, two general outcomes may result at a failure site—the flood water flows over or through the fill surrounding the culvert and stays within the stream channel or the flood water diverts down the road grade possibly entering a different channel. In the first scenario, the fill surrounding the crossing may erode away or even collapse when water is ponded behind the stream crossing because the fill material can't withstand the pressures of saturation. This can result in substantial sediment impacts downstream. Older roads with buried logs and slash in the fill material are most susceptible to this type of failure. In the second scenario, where water leaves the stream and diverts down a roadway, the failure can lead to erosion of road ditches, road fill slopes, and hill slopes as floodwaters flow down and off of roadways. If the diverted water leaves the road and flows onto steep, inherently unstable hill slopes, landslides and debris flows may result. If the diverted water reenters a stream channel that is different than the one it originally exited, and if the new channel is smaller or less erosion-resistant than the original, significant fluvial erosion may occur in the new channel.

During the Baked Apple stream crossing inventory each stream crossing was assessed for diversion potential, potential sediment delivery to streams as a result of crossing failure, and the relative probability of sediment delivery that could result from a 100-year peak flow event. Recent information from the February 1996 flood events, measured as a 100-year event in portions of northwest Oregon and Washington, indicate that a very significant percent of Forest Service road-stream crossings are at risk of failure (Furniss et al. 1998). Knowledge from that and other flood events are the basis for the type of information needed from inventories and used in analysis (Flanagan et al. 1998). However, as yet, no meaningful statistical analysis of historic failures can be applied to more accurately predict future failures. As such, the relative risks among the 173 inventoried stream crossings were assessed and possible quantities of associated sediment delivery were estimated given a 100-year flood in all streams of the watershed.

To help make comparative rankings of roads, a numerical failure potential (from 1 to 5—with 5 being the most likely to fail) was derived for each inventoried stream crossings and a volume of eroded material that could be delivered as sediment to a stream was estimated for each crossing (Engineering Report, Project Record). Probability rankings were also assigned to failure potential and the results from the 173 stream crossings inventoried indicate that:

- An estimated 25,000 cubic yards of sediment could be delivered to streams as a result of failed stream crossings if a 100-year peak flow occurred at all locations.
- 19,000 cubic yards of sediment could result at 78 locations where the expected mode of failure would be fills washing out or collapsing at the stream crossing.
- 27 stream crossings have a failure potential rating of 5, 26 were rated as 4, 47 were rated as 3, 25 were rated as 2, and 48 were rated as 1.
- For a 100-year event, actual sediment delivery is likely to be less because: 1) A 100-year peak flow at all locations is less probable than a 100-year peak flow measured at the mouth of the watershed; and 2) Sediment volumes are based on total sediment available for delivery associated with the sites, but not all would be delivered if emergency flood response efforts or repairs are implemented that stop the erosion processes.

With many stream crossings in the watershed at risk of failure, and with the increased probability of large sediment input during peak flow conditions compared to the unroaded condition in which the aquatic system evolved, the sediment regime of the watershed likely has been or will be altered. The effect that roads have on the sediment regime in the planning area places the sediment regime outside the natural range of variability. Given the road densities in the planning area (4 miles of road per square mile in the Panther 6th field watershed), the environmental baseline is considered to be not properly functioning based on the fact that there are more than 3 miles of road per square miles of land—a threshold established by NOAA Fisheries.

Environmental Effects

Direct Effects

None of the Baked Apple Alternatives would increase the risk of stream crossing failures; therefore, no direct effects to the aquatic environment from sediment associated with stream crossing failures are expected. This is because salvage and fuels treatment operations would not significantly alter the amount of slash or other mobile debris in close proximity to stream channels that would be likely to float downstream. The activities in portions of Riparian Reserves under Alternative 4 are not expected to add to the plugging potential of “at-risk” culvert inlets since only the outside portions of stream buffers would receive treatment.

Indirect Effects and Cumulative Effects

No downstream, indirect effects associated with the Baked Apple alternatives concerning stream crossing failures are expected to occur downstream of either Panther Creek or the face drainages that flow into the North Umpqua River. Since no alternative would affect the condition of stream crossings, no Baked Apple alternative would result in any beneficial or other indirect or cumulative effect to the risk of stream crossing failures.

ROAD RECONSTRUCTION SITES

Affected Environment

Two reconstruction sites would be worked on under Alternatives 2 - 6. Between Draft and Final, the Responsible Official decided to add the reconstruction sites to Alternative 6, but the funding for those sites would be secured through other sources, since no haul is proposed over those two sites under Alternative 6. Neither reconstruction site is included in Alternative 1. Both proposed reconstruction sites are located on road 4714, one at milepost 4.41 and the other at milepost 9.88. These are locations where damaged and plugged culverts, combined with inherent slope instability, pose substantial risk of environmental impact and loss of drivable road prisms due to slope failures. The haul of logs and road rock associated with Alternatives 2, 3, 4, and 5 would further compromise these sites making them a potential safety concern during log haul if not reconstructed prior to implementation of these alternatives; Alternative 6 would not haul over this area, but the two sites would be repaired under this alternative to help alleviate existing and future problems.

Reconstruction at milepost 4.41 on road 4714 would shift the road alignment about seven feet into the hill; remove and stabilize oversteepened, failing fill slopes; replace an existing, plugged 18-inch diameter culvert in a small intermittent stream with a larger diameter culvert; and remove and replace asphalt pavement on about 200 linear feet of the road surface. Approximately 400 cubic yards of excavated and cleared material would be hauled and placed in designated disposal areas.

Reconstruction at milepost 9.88 on road 4714 would replace an existing, plugged and separated 18-inch diameter culvert fed by a spring source with a 28-inch span by 20-inch rise pipe arch; excavate and remove failing fill material containing decomposing and burned out logs; and rebuild the fill with pit-run rocky material. Approximately 300 cubic yards of excavated and cleared material would be hauled and placed in designated disposal areas.

Two existing rock pits would be further developed to produce crushed aggregate, pit run aggregate, and riprap for the reconstruction sites. The Big Leopard quarry is located at T26S, R1E, S17, SE/SE, on the end of road 4714-050 and the Single Quarry is located at T26S, R1E, S34, SW/SW, on the end of road 4720-165. Development and all physical disturbances at both sites would be confined to the previously cleared areas (no clearing and grubbing of trees will be required.)

Environmental Effects

Direct Effects

Alternative 1 has the potential to result in a direct effect to aquatic resources from ongoing chronic sedimentation and possible mass wasting sediment delivery that would continue due to a lack of treatment of the two sites at milepost 4.41 and 9.88. Depending on the funding mechanism secured (and the time it takes to secure the money) for fixing these sites under Alternative 6, the same short term adverse effects, as described under Alternative 1 may also occur.

The plugged culvert at milepost 4.41 diverts intermittent flows down the ditch approximately 500 feet away. This diversion has the potential to cause hill slope gully erosion below the ditch relief culvert. Some of the diverted water is infiltrating into the

road fill material, contributing to a high risk of mass wasting that would likely affect most of the existing road width. Previous fill failures at the site have left an overly steep fill condition with actively failing road shoulders and eroding slopes. Expected future chronic erosion from the untreated site is on the scale of five to ten cubic yards of material per year. Delivery of eroded material to the stream is likely, given the proximity.

At the proposed reconstruction site at milepost 9.88 all water percolates through the fill without entering the culvert, which has a plugged inlet and is separated in the middle. The resulting internal erosion of the fill, exacerbated by buried logs that were burned in the Apple Fire, is causing the fill to collapse, feeding more material to the erosion process. Sediment is delivered directly to the stream at an average estimated delivery in excess of five cubic yards per year. This site has high risk of fill failure, leading to direct delivery of more than 100 cubic yards of material into the small headwater, perennial stream. The result could include initiation of a debris flow. A slope failure immediately below the road at milepost 9.88 scoured the channel below this site a number of years ago.

In the longer term, Alternatives 2, 3, 4, 5 and 6 are expected to result in a direct beneficial effect to the aquatic environment by eliminating the on-going chronic sediment delivery problems at both sites and eliminating the future risk of catastrophic sediment delivery associated with the mass wasting potential directly below these sites. Short-term sediment delivery from the reconstruction sites at milepost 4.41 and 9.88 under Alternative 2, 3, 4, 5, and 6 is likely during the first year following reconstruction as result of disturbed soil associated with implementing the work. Work would be conducted when little to no stream flow is expected to occur. All excavated slopes would be either covered with riprap or mulch and seeded with native grass or treated with other materials to minimize erosion. Should water be flowing at milepost 9.88 during reconstruction, sediment traps or filters would be installed downstream and trapped material removed after reconstruction is completed. At both sites, the resulting short-term sediment delivery would likely be less than the current rate of delivery without treatment.

The use of the two existing rock quarries associated with this reconstruction work would not result in any direct impacts to the aquatic environment or the beneficial uses of water. A mitigation measure is incorporated in all action alternatives that requires drainage work at quarry work areas and quarry access roads to provide adequate drainage to minimize erosion and sediment delivery. Also, the existing rock pits proposed for use would not need any additional development; all work would occur within the existing perimeter of these two quarries.

Indirect and Cumulative Effects

No downstream, indirect effects associated with the reconstruction sites in Alternatives 2, 3, 4, 5, and 6 are expected. This is because the reconstruction sites are well away from downstream fish bearing reaches of Panther Creek and the North Umpqua River. Alternative 1 would result in no indirect effects to downstream beneficial uses because neither of these alternatives would carry out any road reconstruction work.

The work proposed to occur at the two rock quarries is not expected to result in any downstream effects because both quarries are located well away from streams. The required mitigation work at the rock quarries, further reduces the chances of any sedimentation of downstream areas associated with the proposed quarry work. No other indirect or cumulative effects would occur.

ROAD PRISM SURFACES

Affected Environment

Road prisms, which include the roadbed itself, the road ditches, and the fill and cut slopes on either side of the road can deliver sediment to streams in two main ways. One mechanism is the transport of sediment in ditches and road wheel tracks (ruts) that discharge directly into streams at stream crossing during the wet season. The other is from road cross drains that discharge water onto a hill slope in close proximity to a stream where filtering by effective ground cover may not occur. Other delivery mechanisms from road prisms such as surface erosion from bare fill slopes located directly above stream channels or wind transport of dust particles are minor components and relatively insignificant in the planning area.

Environmental Effects

Direct Effects

None of the Baked Apple alternatives would result in any direct effects to the aquatic environment from sediment delivery associated with road cross drains. This is because the road drainage has been recently maintained (work done in the fall, 2002 and summer, 2003) and would be maintained during salvage sale operations. Also, hill slopes and riparian reserves would continue to capture and filter out sediment below ditch relief culverts. Although Alternative 4 would treat riparian reserves adjacent to some harvest units, no substantial loss of effective ground cover is anticipated with the riparian treatments in this alternative. The various timber sales that would emanate from any of the action alternatives would occur during the normal operating season; with contract stipulations that require the ceasing of operations should they result in resource damage. Hence, no direct effects from road prism sedimentation, as a result of wet weather timber haul, are expected. Dust abatement would be applied under the timber sale contract to mitigate any dust that could deposit in streams, so no direct effects would be experienced from dust.

A lack of road maintenance has been correlated to sediment increases from filled in ditches and plugged culverts; however, Alternative 1 would not result in any direct effects associated with an increase of road-related sediment because of the recent 2002 and 2003 road maintenance activities.

Indirect and Cumulative Effects

No downstream, indirect effects to the aquatic environment associated with the use of road prisms under Alternatives 2, 3, 4, 5, and 6 are expected. This is because the mitigation included before, during, and after such use would arrest most of the possibilities of direct effects of sedimentation making the possibility of indirect effects further downstream and later in time non-existent. No cumulative effects would occur.

TIMBER SALE ROAD MAINTENANCE

Affected Environment

Some road maintenance work would be performed under the Baked Apple action alternatives on roads proposed for commercial use associated with the harvest. Drainage maintenance (properly shaping and sloping roadbeds, establishing proper ditch function, and opening plugged culverts) will be done prior to road use, performed as needed during operations, and thoroughly done after final use of each road. This work would occur on currently open roads and on currently closed roads that would be re-opened for timber haul and associated traffic. Timber sale road maintenance is necessary to reestablish functioning drainage systems where needed, to clear roadside brush and remove obstacles that impedes traffic or causes safety concerns, and to mitigate the wear and tear of roads from commercial truck traffic.

The drainage work would include blading ditches and removing accumulated material from ditches, as well as blading native surface and aggregate surfaced roadbeds. Most of the length of roads 4720 and 4720-005 would need little drainage or blading maintenance work prior to commercial use, because this was accomplished with BAER activities.

Haul roads other than 4720 and 4720-005, would require more maintenance work to make them suitable for timber sale use since they were not recently treated. These roads have not had drainage work, brushing, or blading performed for many years. Routine maintenance during timber sale use would depend on the amount of truck haul over the road, but typically consists only of one final blading and correction of any drainage problems that develop during use. Native-surfaced roads would have water bars installed and road barriers placed to prevent damage after commercial use is complete. Aggregate surfaced roads to be closed following use will be barricaded and treated with water bars if needed to prevent drainage problems. Asphalt patching work at several sites between milepost 4.90 and milepost 5.65 would also occur prior to commercial use on the 4714 road. Timber sale road maintenance activities have been classified into four types in order to summarize the differences among the action alternatives (Table 56).

Table 56. Timber Sale Road Maintenance Activities by Alternative.

Maintenance Type*	Miles of Maintenance by Alternative				
	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
1	5.9	5.9	6.1	3.7	4.6
2	21.3	20.4	21.3	18.0	8.8
3	20.8	20.8	20.8	20.8	20.8
4	6.0	6.0	6.0	6.0	2.1
Total Miles Maintained	54.0	53.1	54.2	48.5	36.3

*Type 1--Existing closed system roads (typically native surface) opened with the sale and needing drainage, brushing and blading work prior to use, minimal routine maintenance during use, followed by a final blading, water barring and barricading after use.

Type 2--Existing open roads where drainage, brushing and blading work is needed prior to use, with minimal routine maintenance during use, followed by a final blading after use.

Type 3--Routine maintenance required only, multiple bladings, with little or no work prior to use other than dust abatement.

Type 4--Paved segment of road 4714, with light brushing, drainage maintenance, and asphalt repair work needed prior to use, very little routine maintenance or final maintenance.

Environmental Effects

Direct Effects

To address a Forest Plan Standard and Guideline (IV-83), a mitigation measure that limits ditch blading with the timber sale contract would apply to all Action alternatives to minimize ditch erosion. Timber sale administrators would implement this practice by designating only those areas where ditch blading is necessary, rather than allowing timber sale operators to proceed without such consideration. Consistent with the required mitigation measure, blading segments of ditch that flow directly into streams or where ditch relief culverts discharge in close proximity to streams, would be avoided. Where such ditch blading is absolutely necessary, a mitigation measure included in the timber sale contract to apply erosion control treatments to bladed ditches (such as mulching or placing sediment traps or filters in the ditches) would be implemented prior to the onset of winter weather.

The reopening of existing closed roads and the blading activities on both open and re-opened closed roads can result in short-term increased sediment delivery and a direct effect to the beneficial uses of water compared to doing no blading and no re-opening. This is due to the removal of vegetation and the loosening of soil surfaces making more material subject to erosion and water transport. However, by following Forest Plan Standards and Guidelines for only minimal ditch blading and by maintaining a functioning road drainage system without increasing flow from roads directly into streams, the road maintenance activities associated with the action alternatives would not significantly affect the timing, volume, rate, and character of sediment input, storage, or transport.

Indirect Effects

There is a potential for the Action alternatives to result in indirect effects to downstream aquatic conditions and the beneficial uses associated with timber sale road maintenance activities. However these effects are not considered significant because the small degree of potential sedimentation associated with such activities would be masked by the volume of flow in the North Umpqua River. Moreover, with preventative road maintenance that includes applying the standard and guideline for only minimal ditch blading and the application of erosion control measures on native surface roads following use, the sedimentation potential is expected to remain at low levels making the chances of indirect effects further downstream very low.

Cumulative Effects of Road Work

The limited amount of sediment delivery associated with the two road reconstruction sites and the road maintenance activities of treating roads before and after use is unlikely to result in a cumulative effect to the aquatic environment when added to road-related sedimentation associated with the past, present and reasonably foreseeable activities detailed in Tables 8-10 at the beginning of this chapter. Though the high road density in the planning area places the sediment regime outside the natural range of variability, the amount of short-term road-related sediment delivery from any of the Baked Apple action alternatives is very limited.

The roads built to do commercial thinning and to complete regeneration harvest from the 1950's through the 1980's that resulted in more than 4 miles of road per square mile of land can be expected to contribute to long-term risk of sedimentation. The various road-related, BAER activities displayed in Table 9 such as road grading, ditch cleaning, and site maintenance would contribute to short-term sedimentation over several years. The long-term contribution of sediment is reduced however by these BAER activities with an overall reduction in road-related sediment contributions. The reasonably foreseeable actions that may potentially contribute to cumulative road sedimentation include the Apple Seed Timber Stand Improvement project, the continued and future road work and the Felix Timber Sale. The temporary roads built for the Apple Seed project would be decommissioned and are not expected to contribute to long-term risk of sedimentation given their locations on flat to gentle ground. Soil disturbance associated with continued and future road work would contribute to short-term sedimentation over several years. The long-term contribution of sediment is reduced by continued road work with an overall reduction in road-related sediment contributions. The timber sale maintenance and haul on Road 4714 associated with the reasonably foreseeable Felix Timber Sale would potentially contribute to short-term sediment production in streams within the planning area.

The potential for any of the action alternatives to result in a significant cumulative effect associated with road-related sedimentation is considered to be low or negligible since only short-term sedimentation is expected from the road reconstruction work and the road blading. These activities all have proven mitigation measures applied to them that reduce the actual direct effects to minimal levels; therefore, the cumulative effect of any action alternative on aquatic resources and the beneficial uses of water would be minimal as well.

TIMBER HAUL

Affected Environment

Log truck tires detach pieces of crushed aggregate and finer materials from the matrix of the roadbed that would remain bound without the traffic. Steeper roads with little roadbed maintenance result in more dynamic "washboarding" and slipping with more detachment of bed materials. The transport of detached materials from the roadbed is accomplished by water running over the surface of the road and in the ditches. Without water on the road surface, there would not be much transport that could send sediment to streams. The transport of materials by water is much greater on rutted roads and loaded log trucks hauling in wet weather can create ruts. The presence of ruts increases the amount of material that would potentially deposit in a stream because concentrated water in the ruts detaches and transports road surface materials into ditches or directly into streams if the ruts direct the flow into streams. During rainstorms the ditches may also be flowing water, which aids in the transport of loosened road materials to streams. The season of haul under all action alternatives would be within the normal operating period with contract language stating that haul would be curtailed to avoid resource damage including road-related sediment production from timber haul. Haul could be curtailed during wet conditions anytime during the operating period if such damage is possible.

All haul roads that would be used under all the action alternatives were assessed for their ability to withstand the haul associated with the Baked Apple project. Some roads (4714, 4720 and 4720-005) planned for concentrated haul were assessed by collecting core samples from within the road bed and analyzed for the proportions of fine and coarse materials that make up the roadbed to determine if roads would withstand the projected amounts of haul. All haul roads were found to be adequate to support timber haul during the season of May 1st through November 15th (Geotechnical Engineering Report, Project Record) without having to add additional aggregate, as long as haul is shut down during times of intermittent wet weather that can potentially occur anytime during this period. Use of the roads outside this period would have required the addition of substantial amounts of aggregate to the roads to avoid roadbed damage and excess erosion. However none of the action alternatives would conduct winter haul (after November 15th). The timber haul analysis was based on typical weather patterns. "Unseasonable weather" could result in either a longer or a shorter acceptable season for haul, based on site specific road and weather conditions. The season of haul for all action alternatives would be the normal operating season established in the timber sale contract as May 1st through October 31st. An extended season haul up to November 15th, or possibly later would only occur if agreed to by the purchaser and the Forest Service. Season of haul would require weather and road conditions such that use of the roads would not lead to road or resource damage as stipulated in the timber sale contract.

Segments of 4720 and 4720-005, which would be subjected to heavy truck traffic under the action alternatives, would be treated with dust abatement (calcium or magnesium chloride) to reduce surface wear, to mitigate traffic visibility problems, and to prevent road dust from entering streams. Without dust abatement excessive rutting and wash boarding would develop, leading to greater potential for surface erosion, especially on steeper road grades. Some segments of these roads with the greatest use would receive more treatments to lessen wear and sedimentation (Table 47). Dust abatement binds the aggregate surface together, greatly reducing the amount of detachment of surface particles, as well as making for a longer lasting road surface without washboards or rutting. Road blading would occur as part of the dust abatement application process. A mitigation measure would apply to all chemical dust abatement under all action alternatives requiring no treatment within of an average of 25 feet either side of road stream crossings on perennial streams, and no placement of chemical abatement material within one foot of the outside edge of all road ditch lines.

Environmental Effects

Direct Effects

With Baked Apple, the controlled haul provision under the timber sale contract, use of dust abatement, and required blading to remove ruts as they develop during the haul would limit the amount of surface materials transported to streams from the roadbed. On sections of road without dust abatement, i.e. where restricted immediately adjacent to perennial stream crossings, blading may be required more often than where dust abatement is used. Blading would be kept as current as possible when wet weather is anticipated.

If a light rain occurs on a non-rutted road surface for a short period of time, any detached particles are likely to be transport a short distance and be deposited back onto the

roadbed surface. With heavy sustained rainfalls on rutted roads, the material is likely to leave the roadbed. Most of the roads subject to heavy truck traffic (4720 and 4720-005) are insloped, and transported material is likely to move to the ditches. The 4720-255 would also have substantial haul, but this road is outsloped, and far removed from streams.

Very minimal sediment delivery from haul-related dust is expected under any action alternative because dust abatement would mitigate almost all effects. The no action alternative would result in no direct effects to the aquatic environment or the beneficial uses of water.

Indirect Effects

There is a potential for the Action alternatives to result in indirect effects to downstream aquatic conditions and beneficial uses associated with timber haul. However these effects are not considered significant because the small degree of potential sedimentation associated with such activities would be masked by the volume of flow in the North Umpqua River. Moreover, the avoidance of wet weather haul and other proven mitigation measures are expected to keep the sedimentation potential to low levels making the chances of effects to beneficial uses further downstream very low.

Cumulative Effects

The limited amount of sediment delivery associated with the timber haul is unlikely to result in a cumulative effect to the aquatic environment when added to road-related sedimentation associated with the past, present and reasonably foreseeable activities detailed in Tables 8-10. Though the high road density in the planning area places the sediment regime outside the natural range of variability, the amount of short-term road-related sediment delivery from any of the Baked Apple action alternatives is very limited and not considered significant.

Conclusions

By following standards and guidelines for only minimal ditch blading; by not increasing the transport of sediment into ditches that flow directly into streams; and by maintaining the proper function of road drainage structures and surfaces, the road-related activities and uses associated with the Baked Apple action alternatives would not significantly affect the timing, volume, rate and character of sediment input, storage, or transfer. There would be no appreciable change in the sediment regime caused by road-related activities in the Panther Creek subwatershed or at the scale of the Middle North 5th-field watershed. The road-related activities associated with the action alternatives would not degrade the sediment and turbidity indicator considered by NOAA Fisheries during conferencing.

WATERSHED CONDITIONS AND FISH DISTRIBUTION

The maintenance and protection of watershed conditions is addressed within several objectives of the Aquatic Conservation Strategy. The need to maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of aquatic systems is the focus of ACS objective 1. NOAA Fisheries uses the assessment of four indicators of watershed condition during conferencing for fish species that have the potential for federal listing. Three of these indicators are addressed in this section—watershed road density, disturbance history, and condition of riparian reserves. The fourth watershed condition indicator, management-related landslide rates is addressed previously in this chapter under Erosion and Sedimentation.

Affected Environment

Panther Creek 6th field Sub-watershed

Panther Creek is a major tributary to the North Umpqua River with a watershed area of 12,167 acres. Within the sub-watershed there are approximately 87 miles of road equating to 4.0 miles of road per square mile. Panther Creek sub-watershed supports populations of both anadromous and resident salmonids (Figure 67) as well as several species of non-game fish. Salmonid species present include winter and summer Oregon Coast steelhead, resident rainbow trout, Oregon Coast coho salmon, and resident cutthroat trout. Some of the rainbow trout may have originated from introductions of hatchery trout into various ponds and sumps throughout the basin. There is also the potential for use by anadromous (ocean going) and fluvial cutthroat trout⁵³ well up into the basin as well as Oregon Coast spring chinook in the very lower reaches of Panther Creek however, to date neither of these species has been documented in the Panther Creek sub-watershed. Oregon Coast (OC) coho, Umpqua River cutthroat trout, OC chinook salmon and the Umpqua chub are on the USDA Forest Service Region 6 sensitive species list⁵⁴.

The Panther Creek 6th field sub-watershed is subdivided into four 7th field drainages. They are Panther Creek, Limpy Creek, Fairy Creek, and Bachelor Creek. In addition a small portion of the Apple Creek face is included in the Baked Apple Timber Sale planning area. This includes approximately 1,760 acres immediately northeast of the Limpy drainage that drains directly into the North Umpqua River.

⁵³ Fluvial cutthroat are a stock of cutthroat that spawn and rear in tributary streams and migrate to a larger river to spend their adult life, returning to spawn in the natal tributary).

⁵⁴ Sensitive species are managed by the Forest Service to prevent the likelihood that these species would need to be listed under the Endangered Species Act.

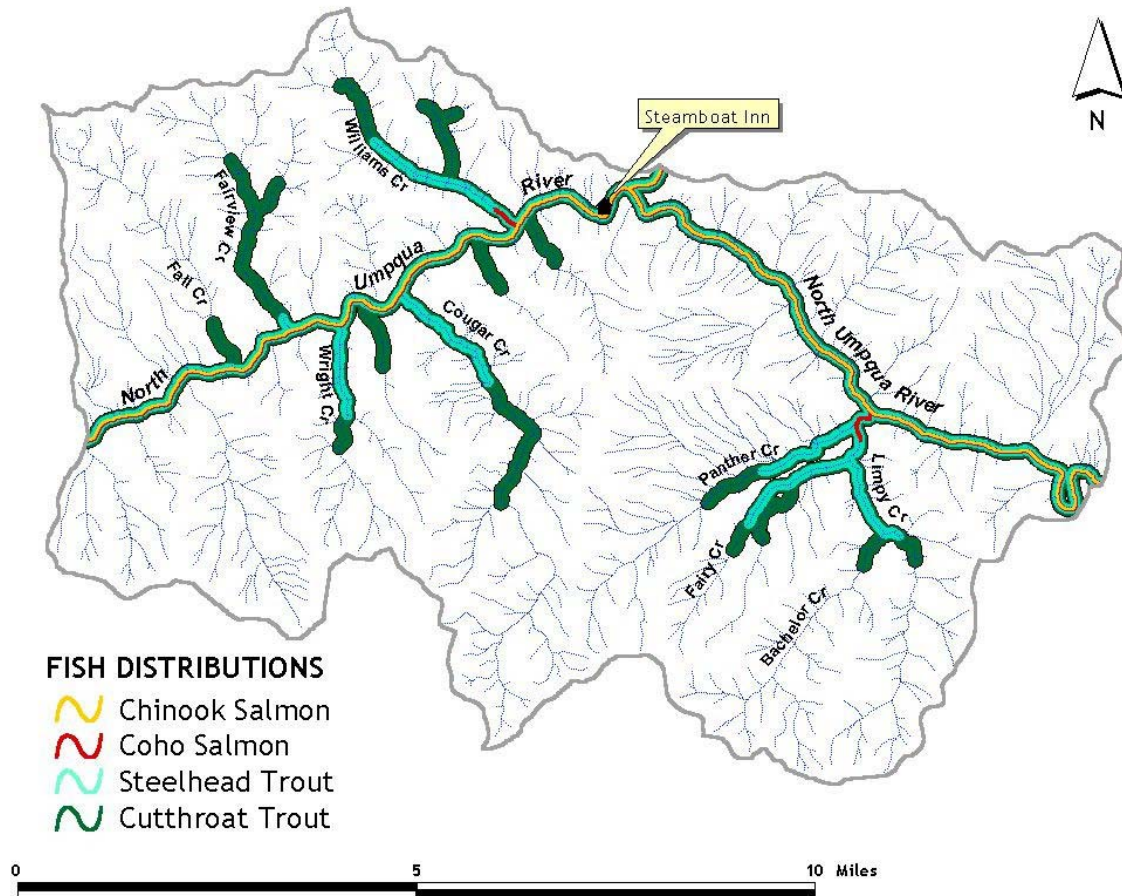


Figure 67. Fish distribution in the portion of the Middle North Umpqua 5th field watershed managed by the Forest Service, including Panther Creek.

7th field Drainages of Panther Sub-watershed

Panther Creek Drainage

The Panther Creek 7th field drainage is 4,255 acres in size and is located in the northwest corner of the Panther Creek 6th field sub-watershed. Panther Creek drainage is dominated by moderately steep, dissected land forms interspersed with areas of gentle terrain. Side slopes in Panther Creek can exceed 80 percent. The stream has approximately 1 mile of anadromous fish habitat and 1 mile of resident salmonid habitat. The lower 0.3 miles of Panther Creek is habitat for Oregon Coast coho salmon.

Timber harvest activities and road building began in the 1950's and continued up to the early 1990's. Approximately 43% of the Panther Creek 7th field drainage has experienced timber harvest. About 41% of the riparian reserves along perennial streams have experienced harvest. The Panther Creek drainage has approximately 30 miles of road miles of road with a road density of 4.6 miles per square mile of land.

This stream can be characterized by the impacted condition of its lower 1.5 miles. Much of the habitat in this lower reach is extremely over simplified, with very few pieces of large wood, very little deep pool habitat, and an overabundance of bedrock in both the stream channel and stream banks. While this channel appears to be very stable, it is

lacking the complexity that once existed, resulting in a less productive stream system overall.

The proximity of the valley bottom road⁵⁵, as well as extensive timber harvest and stream clean out along the stream channel, resulted in the removal of the majority of the existing and future sources of large wood. Over time, this lack of channel complexity allowed the erosive forces of winter and spring flows to scour much of the channel down to bedrock. Without restorative actions the recovery process would be delayed for decades due to the shortage of available large wood adjacent to the stream channel. Restoration efforts in the 1980's included the installation of several log weirs in portions of lower Panther and lower Limpy Creeks. These structures have trapped sediment and gravels and have provided some complexity to the stream channel.

Limpy Creek

The Limpy Creek 7th field drainage is 3,134 acres in size and is located in the eastern portion of the Panther Creek 6th field sub-watershed. Limpy Creek drainage is dominated by steep dissected land forms interspersed with smaller areas of gentle terrain. Side slopes in the Limpy Creek drainage can exceed 80%. The stream contains approximately 1 mile of anadromous fish habitat and 1 mile of resident salmonid habitat. The lower 0.6 miles of Limpy Creek is habitat for Oregon Coast coho salmon.

Timber harvest activities and road building began in the 1950's and continued up to the early 1990's. Approximately 36% of the Limpy Creek 7th field drainage has experienced timber harvest. About 19% of the riparian reserves along perennial streams have experienced harvest. The Limpy Creek drainage has a total of 17.3 miles of road. This equates to about a road density of 3.5 miles per square mile.

Limpy Creek has experienced the least amount of timber harvest of the four drainages. As with 2 of the other 3 drainages the lack of large wood and over abundance of channel scoured to bedrock is clearly evident in the lower reaches which have valley bottom roads adjacent to them. Pool habitat is generally limited in quantity and quality and there is an overall lack of complex habitat within these reaches.

It is likely that the relatively large amount of timber harvest that has occurred in the Fairy and Bachelor drainages, which drain into Limpy Creek, have resulted in peak stream flows that are higher than historic flows during storm events. The extent of this flow change is unknown, but it may have contributed to the simplification of habitat over time.

Limpy Creek below Fairy Creek and Panther Creek below the confluence with Limpy Creek (Figure 67) appear to be the most highly utilized anadromous habitat in the Panther Creek 6th field sub-watershed. It is likely that low summer flows and limited pool habitat in the other anadromous drainages force a large portion of rearing steelhead out of their natal streams and into the larger waters of lower Limpy and Panther Creeks. Oregon Coast coho salmon spawn and rear in the lower 0.3 miles of Panther Creek below Limpy Creek and in the lower 0.6 miles of Limpy Creek below Fairy Creek. Coho migration is blocked by a falls at Fairy Creek. There is no data or anecdotal information that suggests coho migrate above this point. At this point there is a water fall that blocks migration both into the higher reaches of Limpy Creek, as well as into Fairy Creek.

⁵⁵ A valley bottom road parallels a stream (in the valley of the drainage).

Restoration efforts in the 1980's included the installation of several log weirs in portions of lower Panther and lower Limpy Creeks. These structures have trapped sediment and gravels and have provided some complexity to the stream channel.

Fairy Creek

Fairy Creek 7th field drainage is 2,055 acres in size and is located in the west central portion of the Panther Creek 6th field sub-watershed. Fairy Creek is dominated by steep dissected land forms interspersed with smaller areas of gentle terrain. Side slopes in the Fairy Creek drainage can exceed 80 percent. The stream contains approximately 0.5 miles of anadromous fish habitat (steelhead and cutthroat) and 2.3 miles of resident cutthroat trout habitat. There are no Oregon Coast coho salmon or coho habitat in the Fairy Creek drainage.

Timber harvest activities and road building began in the 1950's and continued up to the early 1990's. Approximately 49% of the Fairy Creek 7th field drainage has experienced timber harvest. Nearly 41% of the riparian reserves along perennial streams have experienced harvest. The Fairy Creek drainage has approximately 14 miles of road with a road density of 4.2 miles per square mile.

Fairy Creek is probably the most impacted 7th field drainage in the Panther Creek sub-watershed. This creek was subjected to many of the same management impacts as the Panther Creek drainage, with extensive timber harvest and a valley bottom road present along its lower 1.5 miles. Additionally, a large road-related debris flow occurred in the headwater reaches of the stream. This torrent was triggered by the large storm event of 1964 and effectively scoured the channel and destabilized the stream banks for approximately 1.5 miles. Many of the stream banks in this area are still a chronic source of fine sediment from fluvial erosion.

In 1993 and 1995 a total of 80 large logs were placed in the lower 0.5 miles of Fairy Creek to jump start the long-term restoration process in the stream. Since their placement some of these logs have captured additional woody material and are trapping and storing sediment. Over time it is expected that these structures will continue to collect additional woody material and continue to trap and store sediment and fine bed load materials. Log placement in Fairy Creek was coupled with riparian planting and road-related restoration (up-sizing culverts and pulling back overly steep fills).

Although some restoration efforts have occurred, fish habitat in Fairy Creek is still in a simplified condition. As in the Panther drainage there is still an abundance of high gradient shallow riffle habitat. Additionally, observations indicate that Fairy Creek contains higher levels of fine sediment during winter storm events and base winter flows when compared to other streams in the Panther Creek 6th field sub-watershed.

Bachelor Creek

Bachelor Creek 7th field drainage is 2,723 acres in size and is located between Fairy Creek and Limpy Creek in the southeastern portion of the Panther Creek 6th field sub-watershed. Bachelor Creek is dominated by steep dissected land forms interspersed with smaller areas of gentle terrain. Side slopes in the Bachelor Creek can exceed 80%. This small stream is steep and rugged, and only provides approximately 0.1 mile of anadromous fish habitat near its mouth. It provides about 0.6 mile of resident salmonid

habitat above the blockage to anadromous fish. There are no Oregon Coast coho salmon or habitat in this drainage.

Timber harvest activities and road building began in the 1950's with a majority occurring in the 1960's and late 1980's. Approximately 47% of the Bachelor Creek 7th field drainage has experienced timber harvest. Nearly 38% of the riparian reserves along perennial streams have experienced harvest. The Bachelor Creek drainage has a total of 19 miles of road with a road density in the drainage of 4.5 miles per square mile.

As in Panther and Fairy Creek drainages, Bachelor Creek has also experienced management-related impacts with riparian harvest and a valley bottom road adjacent to the channel. Levels of large wood have been limited in the upper portions of the mainstem where timber harvest allowed access for removal.

While Bachelor Creek provides little habitat for anadromous fish it is important for its contribution to the resident trout population in the Panther Creek 6th field sub-watershed. To the best of our knowledge, no barrier modifications have been made nor have any ponds or sumps been stocked within the drainage. It is possible that the resident trout populations present in this system have not been influenced by outside gene pools and represent a "pure" strain of resident fish that have evolved within the Panther Creek sub-watershed.

Bachelor Creek is also important as a contributor to stream flow to downstream habitats in Limpy and Panther Creeks during the dry summer months. When compared to the flow of Limpy Creek above its confluence with Bachelor Creek, the flow provided by Bachelor Creek is typically almost twice that amount. The respective drainage areas of each are nearly identical. This flow contribution is important in that the majority of anadromous fish within the Panther sub-watershed rear in the lower one mile of Limpy Creek and lower Panther Creek. In addition Oregon Coast coho salmon spawn in lower Panther Creek below Limpy Creek and the lower 0.25 miles of Limpy Creek.

Tributary Channels of the Various 7th field drainages

Class IV first and second order stream channel conditions vary widely within the Panther Creek sub-watershed. These tributary streams have experienced management reflective of the management seen within their respective drainages. Class IV channels typically do not have valley bottom roads because they are located on steep terrain with narrow floodplains. The tributary channels have had a higher degree of harvest alongside and across the channels with no buffers, plus many have had roads built across them. Many of these channels have gradients in excess of 40% with side slopes up to and exceeding 80%. Harvest through these streams has reduced or removed existing and future large wood. In these areas, fluvial erosion has caused channel down cutting and increased sediment delivery to downstream habitats. Other class IV channels that have had little or no harvest are in better condition, yet some sections of unharvested tributary channels show signs of excessive scour. Roads, and roads coupled with harvest above these areas of mature forest have impacted these channels.

Apple Creek Face Drainage

The part of Apple Creek drainage included in the Baked Apple Planning area is approximately 1,760 acres in size and is located northeast of the Limpy Creek drainage.

This face drainage⁵⁶ has less than 0.25 miles of non-fish bearing perennial stream and approximately 1 mile of class IV intermittent channel. These streams feed directly into the North Umpqua River. Harvest has occurred in this drainage mostly near the ridge top and on the upper slopes. The very steep side slopes that fall away towards the North Umpqua have largely remained un-harvested. Across this portion of Apple Creek Drainage there are approximately 6.8 miles of road, equating to 2.5 miles per square mile. Because of the steep nature of the landscape very little roading occurs in riparian reserves. Channel conditions range from fair to good. Most of the channels are in good condition with ample amounts of large wood.

Summary of the Affected Environment of Panther Creek and its Drainages

The Panther Creek sub-watershed has been extensively impacted by past timber harvest, roading, and associated management activities. Existing road densities are high within the Panther Creek sub-watershed at 4.0 miles per square mile of land area. Therefore, this NOAA Fisheries indicator is classified as 'not properly functioning' because road densities are greater than the 3 miles per square mile threshold. Although the sub-watershed had experienced substantial hydrologic recovery over the last several decades, past harvest and management has maintained a strong signature across the landscape. The Apple fire of 2002, although within the range of natural variability, has set back the recovery significantly. Therefore disturbance history is also classified as 'not properly functioning' because of the amount of past and recent (Apple Fire) disturbance in this 6th field watershed. The final watershed condition indicator covered in this section is riparian reserves. Riparian reserves are considered 'at risk' within the Panther Creek sub-watershed because they are less than 80% intact. Approximately 66% of Limpy and 33% of Bachelor Creek riparian reserve were stand-replaced; plus, the sub-watershed riparian zones have experienced timber harvest, road construction, and stream clean-out.

The quality of habitat within the Panther Creek 6th field sub-watershed varies within the 7th field drainages and ranges from good to poor. The majority of the aquatic habitat within the drainages can be described as less than optimum. Several areas were in poor condition and in need of active restoration. Most of these areas with poor habitat conditions have valley bottom roads or harvest units adjacent to them and have had their large wood component removed.

The large wood and log jams formerly present in this system served the function of storing sediment, creating pools, slowing high water velocities, providing spawning habitat for resident and anadromous salmonids, and providing a "stepped" channel profile along which much of the gradient drop was over short wood-created falls. This stepped channel type originally gave a large portion of the stream an overall lower gradient, contained more spawning and rearing habitat, and had better accessibility to spawning and rearing habitat than might otherwise be available. The removal of the large wood from the system reduced the complexity and roughness of many portions of the channel to the point where many of these channel segments were scoured down to bedrock. Although much of the bedrock is rough in nature and frequently provides adequate pool habitat in terms of quantity, most of the pools lack the complexity and diversity necessary to support all portions of a healthy aquatic ecosystem.

⁵⁶ Face drainages are typically small tributaries to a larger stream or river that typically drain a small area immediately adjacent to or facing a larger river.

Observations of the Panther Creek system during storm events indicate that this system has a high level of turbidity when compared to other watersheds of similar size. Surveys in the Fairy Creek and Panther Creek drainages provide insights into the potential causes of this condition. Both of these drainages have areas of mass wasting and/or stream bank cutting. A majority of these areas appear to be management- related and are chronic sources of erosion and sediment during storm events.

Excessive amounts of suspended and deposited sediment can limit spawning habitat and success. Survival and emergence of steelhead embryos and other salmonid species is reduced when fine sediments constitute greater than 20%-25% of the substrate (Bjornn and Reiser 1991). High proportions of fine sediment in the substrate reduce survival to emergence by entrapping newly hatched embryos, decreasing dissolved oxygen, and reducing intragravel water flow.

The substrate composition of both the streambed and the stream banks can be a good indicator of the general character/health of the habitat found within the stream ecosystem. Substrates in the surveyed portions of the Panther Creek drainages were found to be relatively coarse ranging from cobble dominated to bedrock dominated. These types of substrates are generally considered stable.

Pebble counts were made during stream surveys that provide a profile of the substrate composition. Pebble counts indicated that fine sediment, those particles 6 mm in diameter or less, did not comprise a major portion of the substrate profile within the basin.

Several stream reaches appear to contain an abundance of bed rock in both the streambed and stream banks. The lower 1.5 miles of Bachelor Creek and the lower 1.3 miles of Limpy Creeks are dominated by bedrock. In certain cases, such as in Limpy Creek, it is likely that the dominance of bedrock can be attributed, in part, to the removal of large wood from the channel, which allowed the majority of the accumulated gravels and cobbles to be flushed from the system thereby exposing the bedrock. In other cases, such the lower 1.5 miles in Bachelor Creek, the dominance of bedrock can be attributed to the steep nature of the stream channel and the deeply incised narrow gorge through which the stream flows.

In general, channels that are dominated by bedrock are extremely stable but not very productive biologically. These channel areas often lack the complexity of substrates that provide hiding cover for juvenile salmonids as well as interstitial spaces to support healthy and diverse populations of aquatic invertebrates.

Post-Fire Watershed Conditions

The Apple fire of 2002 burned across an area of 18,000 acres. Most of the 12,167 acre Panther Creek sub-watershed is within the fire perimeter. Much of the burn was mosaic in nature. Approximately 4,000 acres burned as a stand replacing fire. Most of the stand replacing burn area occurred in the Limpy Creek 7th field drainage with lesser amounts in the Panther, Fairy, and Bachelor Creek drainages.

The 2002 fire is expected to cause changes to stream channel conditions within the Panther Creek 6th field sub-watershed over the next 2 decades or longer. Stream channel conditions in Limpy and Bachelor Creek would be particularly susceptible to changes due to the extent of stand-replacing burn that occurred there (Table 57).

Table 57. Drainage Areas that Experienced Stand Replacing Fire in 2002.

Percent by Area	7th field Drainages - %			
	Panther	Limpy	Fairy	Bachelor
Riparian Areas	9.2	66	26	33
Total Drainage	7.2	61	25	28

Not only are changes expected to occur over time, some changes were apparent shortly after the fire such as the stream temperature and water quality changes described earlier in this chapter. An influx of sediment can be expected over the next decade or two, but observations during the first winter following the fire revealed that little to no sedimentation had occurred.

Environmental Effects on Watershed Conditions

Road Density

None of the action alternatives would build any new permanent roads nor would any alternative decommission any permanent roads; therefore road density would not change in the sub-watershed as a result of any alternative. All action alternatives propose varying amounts of temporary road (Table 6 in Chapter 2). The minimum amount of temporary road that would be constructed is 1.24 miles, while the greatest amount would be 2.32 miles. Not all of the temporary roads are new construction because pre-existing temporary roads, which had not been restored in the past, would be used again and decommissioned following use with the Baked Apple sale. New temporary road construction ranges from 0.8 miles to 1.05 miles. Alternative 5 does not propose construction or use of temporary roads.

The use of existing temporary roads or the building of temporary roads followed by their subsequent decommissioning immediately following use for the timber sale would not lead to any long-term effects on watershed conditions because none of the temporary roads have ditchlines, none would have permanent compaction and none would cut across hillslopes; all are on ridgetop locations where hydrologic processes would not be affected.

Disturbance History

The action alternatives would only remove dead trees (with a few exceptions), which do not have crowns to contribute to hydrologic recovery and do not have live roots to contribute to slope stability. All of the high risk unstable areas would not be salvaged in all action alternatives. In Alternative 3, the high-moderate risk areas were also removed from harvest consideration, further decreasing the risk of landslides occurring without the large wood component in this alternative. None of the Baked Apple alternatives are expected to result in any direct effects to the watershed disturbance process.

The indirect and cumulative effects are equivalent to those displayed in detail in the peak flow section of this Chapter. This indicator is not expected to be affected by the implementation of any of the action alternatives.

Riparian Reserves

The Baked Apple project involves one alternative that would conduct activity within the riparian reserve. Alternative 4 would harvest timber from approximately 32 acres of riparian reserve in Limpy Creek. These harvest areas are within either class I or II streams and are designed to meet long-term riparian reserve objectives by lessening the risk of future fires in the portions proposed for treatment. There would be no harvest within 180 feet of any class II or II stream channel. In addition to the small amount of riparian harvest, there would also be some fuel reduction within the riparian reserve on a total of 233 acres designed to meet long-term objectives for the riparian reserve allocation. All riparian treatments under Alternative 4 would be directly adjacent to existing upland harvest units. No treatment would occur in the primary floodplain or within 75 feet of class I and II stream channels while class III and IV channels would be protected by a 50 foot no activity buffer. Also, some logging corridors may occur across riparian reserves where riparian reserve trees could be knocked down or in some case would have to be fallen. In all such cases, the trees would be left in place within the riparian reserve.

Direct Effects

Implementation of Alternative 4 is not expected to directly impact the condition of riparian reserves. This is because the extraction of dead trees from the riparian reserve along class I and II streams would only take place on a total of 32 acres and the removal of these trees would occur outside of a 180 foot buffer. Most of the wood recruitment to streams occurs within the first 65 feet of the stream (Murphy and Koski, 1989; McDade et al 1990). In addition forest fuels reduction would occur across 233 acres of riparian reserve. A minimum 75 foot, no treatment buffer would be in place along class I and II streams and a 50 foot buffer along class III and IV stream channels. Coho salmon habitat is approximately 0.25 miles downstream of the nearest riparian treatment unit. This alternative was designed in part to meet the objectives of the riparian reserve land allocation, on a limited scale, by lessening the risk of the effects of future fires to riparian conditions.

The other action alternatives would treat no riparian reserve acres, so no short-term direct effect to LWM recruitment is expected as a result of implementation. The incidental loss of standing riparian reserve trees due to logging corridors that bisect riparian reserves is expected to be of minimal direct impact to riparian reserves due to the limited scope and scale of such impacts and the fact that any trees that are knocked over or that are felled would remain within the reserve. None of the Baked Apple alternatives are expected to result in any direct effects to the availability of large wood resource entering streams. Since LWM is pivotal to the condition of pool character and to the maintenance of low velocity refuge habitats, and since LWM recruitment would not be directly affected by any of the Baked Apple alternatives, neither pool nor velocity refuge habitats would be affected by implementation of any Baked Apple alternative.

There are two stream crossing reconstruction sites associated with the action alternatives. Both locations are on forest road 4714 in the Panther Creek drainage. One of the sites crosses an intermittent, class IV channel while the other crosses a perennial class III channel. Both of these crossings are high up in the watershed far from fish distribution and at least 3.5 miles from coho habitat. This reconstruction would impact the riparian reserve by removing approximately three, 14-inch to 16-inch green Douglas-fir trees from the existing fill slope. The cut logs would be placed back on the finished slopes.

The direct, indirect and cumulative effects of these road treatments within riparian reserves are disclosed previously in the Road Construction Sites section of this Chapter.

Indirect and Cumulative Effects

Alternative 4 could potentially result in an indirect beneficial effect on the future condition of LWM in riparian areas and streams because it may result in potentially less riparian areas burned in the future compared to the other Baked Apple alternatives. The rest of the alternatives would be less likely to result in such an indirect effect, particularly Alternatives 1 and 5, which result in the most risk of future fires due to the residual fuels left after implementation.

The potential of experiencing larger fires in the future due to greater amounts of residual fuels left as a result of no action (Alternative 1) or left following implementation of Alternative 5 has the potential of becoming part of a cumulative effect to riparian reserves when added to past management activities that harvested along riparian areas during the decades of the 1950's through the 1980's, the very long-term effects of roads that parallel and cross streams negating any recovery of riparian vegetation within such roads, plus the existing and future ongoing effects of the 2002 Apple fire within riparian reserves.

Conclusions

Watershed conditions would likely be maintained in the existing, post-fire conditions, and none of the Baked Apple alternatives would tend to cause any of the watershed condition indicators discussed above to be degraded as a result of implementation. In the longer term, alternatives that leave more residual fuels may lead to larger future fires potentially affecting watershed conditions of the 6th-field Panther Creek watershed with some minimal downstream effects in the North Umpqua River. Larger fires could also spread into the 5th-field Middle North Umpqua watershed potentially setting back watershed conditions at a broader scale.

STREAM HABITATS

The maintenance and protection of stream habitats is the focus of several objectives of the Aquatic Conservation Strategy. The maintenance and restoration of the physical integrity of shorelines, banks, and bottom configurations is addressed in objective 3. ACS objective 8 addresses the supply and distribution of large woody material and ACS objective 9 focuses on the long-term maintenance and restoration of habitat for riparian dependent species. NOAA Fisheries uses the assessment of five habitat elements during conferencing for fish species that may become listed. These habitat features rely, in part, on the presence of large woody material for proper functioning.

STREAM SUBSTRATE

Affected Environment

The composition of the streambed substrate changes over time and usually reflects the disturbance history in a watershed. The environmental baseline used by NOAA Fisheries for conferencing places stream substrate 'at risk' in the Panther Creek sub-watershed because the area of streambed covered by gravel and cobble is less than the area of streambed that is bedrock.

Stream surveys from the 1990's indicated that the Panther Creek sub-watershed, including its four 7th field drainages, was dominated by relatively coarse substrate and bedrock. Interspersed within the coarse substrates are areas of smaller cobbles and gravels. These surveys reported that fine sediment was not adversely impacting the aquatic system. It is likely that there are more extensive areas of exposed bedrock stream channel than prior to management in the sub-watershed. Yet, widespread wild fires over the decades might have also resulted in areas of bedrock due to increased peak flows following fires. Timber was clear-cut, roads were built, and wood was removed from stream channels. As a result, increased peak flows/fluvial erosion coupled with destabilized hill slopes and lack of in-stream wood caused channels to be flushed of much of their gravels and cobbles.

Stand replacing fire can affect in-stream substrates. Fine sediment can be more easily eroded from burned hill slopes while the risk of mass wasting is increased due to loss of tree root strength. In-stream large woody material can be incinerated thereby releasing trapped sediment and gravels to be flushed from the area. Elevated sedimentation of stream beds from the fire-related surface erosion across the sub-watershed would be expected to recover to pre-fire levels in 3 to 5 years. The elevated risk of mass wasting and fluvial erosion is expected to be longer lived. In years where precipitation is at or below normal and no significant rain on snow events occur, mass wasting and increased fluvial erosion would not be expected to be problematic. Conversely, if the sub-watershed were to experience high intensity, long duration rain or rain-on-snow there would likely be a higher incidence of mass wasting and fluvial erosion. These events, plus the scale and intensity of the fire in the sub-watershed, are within the range of natural variability.

Large amounts of sediment and other fines delivered to the stream could affect a change in the composition of the substrate. By filling in the interstitial spaces⁵⁷ of the stream bed substrate, the overall character and health of the stream can be affected. Substrate can also be flushed from a stream channel by peak flows. The instream wood additions occurring in the fall of 2002 will help to moderate water velocities in the winter and trap, store, and meter fine sediment and larger gravels that enter the stream, improving aquatic habitat for fish and other aquatic organisms.

⁵⁷ Interstitial spaces are the cracks and crevices between gravel and cobble bed materials that are important habitats for aquatic organisms such as aquatic insects and juvenile fish.

Environmental Effects

Direct Effects

None of the Baked Apple alternatives are expected to result in any direct effects to stream substrate. Stream channel substrates in the harvest areas are very coarse, dominated by cobbles, small boulders, and bedrock. These types of channels are very stable and resilient to disturbance. In all action alternatives highly sensitive hillslope areas would be eliminated from salvage activities to reduce the potential of mass wasting occurring without the large wood component. In Alternative 3 the high-moderate probability areas for mass wasting were removed from salvage areas. By leaving the dead trees on these sites the potential for mass wasting is not decreased but if a mass wasting were to occur the snags would be incorporated with the slide and potentially delivered to the stream as LWM. Moreover, the large wood associated with the slide would act to slow, store, and meter out the sediment over time improving the long-term character of the substrate.

Alternative 4 proposes a small amount of riparian treatment. Riparian fuel treatments as prescribed in Alternative 4 would have minimal ground disturbance and would not occur on a widespread basis. There would be no fuels treatments in the active floodplain or within 75 feet (whichever is greater) of class I and II streams. Along class III and IV streams there would be no fuels activity within 50 feet of the stream channel. Riparian harvest in this alternative would only occur outside a 180 foot buffer.

The mechanisms that could cause a change in stream substrate are not expected to be significantly altered by any of the Baked Apple action alternatives. Peak flows are expected to increase as a result of the fire, but not due to the implementation of any of the Baked Apple alternatives. Surface erosion has already begun to subside because eroded materials are beginning to be retained by the regrowth of herbaceous and woody vegetation. Large wood has been placed in stream channels which will trap, store, and meter out sediments over time. Stream banks would be protected by maintaining adequate stream side buffers. Finally, mass wasting, the most significant mechanism that could directly affect substrate character is not expected to be affected by any of the action alternatives.

Indirect and Cumulative Effects

Alternatives 1 and 5 that result in more risk of larger fires in the future compared to the rest of the alternatives, could indirectly affect stream substrate by leading to more erosion and potential sedimentation of stream substrates. This would depend on whether future fire starts escape, and whether such fires are followed by intense winter weather.

Cumulative effects to stream substrates are not expected under any alternative since the scope and scale of the potential direct and indirect effects associated with the Baked Apple project are very limited and not likely be of a magnitude to result in a cumulative effect.

Affected Environment

LARGE WOODY MATERIAL

The presence and future availability of large woody material in riparian areas and streams is key to attaining stream habitat complexity and stability to ensure the proper functioning of aquatic systems. Stream surveys indicate that LWM in the Panther Creek 6th field sub-watershed is below the range of natural variability due to past management activities. The environmental baseline used by NOAA Fisheries for conferencing places LWM in the 'at risk' category for the Panther sub-watershed because past riparian harvest continues to limit recruitment. The BAER inchannel work and the new recruitment potential associated with the Apple Fire is expected to improve the trend in Limpy and Bachelor Creeks, moving these drainages within or near the natural range of variability and within a baseline of properly functioning in the next decade.

Within the main stem channel of Limpy Creek, twenty-four log structures were constructed. Within the lower 0.5 miles of Bachelor Creek, six log structures were completed. One hundred and twenty-five logs were used along approximately 3.5 miles of stream. Structures consist of a single log to complex multi log jams. These structures were designed and placed in areas of the channel where constrictions would naturally capture large wood and in areas where large wood had been removed during past stream clean-out. The structures are designed to capture, store and meter out sediments and gravels over time as well as capture additional large and small woody material migrating downstream. Fairy Creek has had approximately eighty pieces of large wood added to its channel in the mid 1990's, and lower Panther and Limpy Creeks had several wood structures placed in the 1980's. Large woody material placed in Fairy and Panther stream channels prior to the Apple Fire of 2002 survived the burn.

POOL CHARACTER

Pools within streams are important habitats, particularly for fish. The environmental baseline used by NOAA fisheries for conferencing places pool characteristics 'at risk' in the Panther sub-watershed due to a reduction in pool habitat by area of stream. Timber harvest and road building have been contributors to the over all reduction of pool character because of the effect to sediment routing, flow regime, and large wood recruitment--important factors in pool formation and maintenance. Removal of large wood from the stream channels has played a major role in the decrease in pool habitat. Pool habitat in the sub-watershed will likely degrade over the short-term due to the effects of the fire on stream morphology. The accelerated sedimentation process following the fire may fill some existing pool habitat. This can be expected to be offset in part by the post-fire wood additions in both main stem and tributary channels.

The addition of large wood into Limpy and Bachelor Creeks will help the streams to create new pools and may enhance existing pools. Large wood will trap sediment and gravel and help create scour, dam, and plunge pools. Large wood placed in smaller tributary channels will also trap and store sediment, as well as moderate flow velocity from these lower order channels.

LOW VELOCITY REFUGE HABITAT

Low velocity refugia exist in areas where the stream gradient is less than 3%. These habitats are important to fish, especially in the winter when they seek out such areas in order to survive peak flows. The environmental baseline used by NOAA fisheries for conferencing places low velocity refuge habitats 'at risk' in the Panther sub-watershed due to limited availability of such refuges within low gradient sections of Panther, Limpy, and Fairy Creeks.

Stream surveys indicate that planning area channels are predominantly moderate to high gradient, incised channels interspersed with short segments of lower gradient channel. Large woody material is the driver for maintaining properly functioning refugia within the low gradient sections of main stem reaches of Limpy, Bachelor, Fairy and Panther Creeks. Given the large wood placement in Limpy and Bachelor Creeks as well as the new recruitment potential from the fire along these streams (Table 54), both are expected to move within the natural range of variability for low velocity refuge habitat within a decade. Velocity refuge habitat in lower Fairy and Panther Creeks is expected to remain static due to less large wood present now and less recruitment potential in the future.

Environmental Effects

Direct Effects

The Umpqua National Forest LRMP has a Standard and Guideline that calls for the retention of streamside trees and snags likely to fall into the stream in the future (IV-33). Alternative 4 would harvest some standing dead timber from the riparian reserve land allocation to reduce fire risk. Implementation of Alternative 4 is not expected to measurably impact current or future levels of LWM. This is because the extraction of dead trees from the riparian reserve along class I and II streams would only take place on a total of 32 acres and the removal of these trees would occur outside of a 180 foot buffer. Most of the wood recruitment to streams occurs within the first 65 feet of the stream (Murphy and Koski 1989; McDade et al 1990). In addition forest fuels reduction would occur across 233 acres of riparian reserve. A minimum 75 foot, no treatment buffer would be in place along class I and II streams and a 50 foot buffer along class III and IV stream channels. Coho salmon habitat is approximately 0.25 miles downstream of the nearest riparian treatment unit.

Alternative 4 would be consistent with the Forest Plan direction. The other action alternatives would treat no riparian reserve acres, so no affect to LWM recruitment is expected. None of the Baked Apple alternatives are expected to result in any direct effects to the availability of large wood resource entering streams. Since LWM is pivotal to the condition of pool character and to the maintenance of low velocity refuge habitats, and since LWM recruitment would not be directly affected by any of the Baked Apple alternatives, neither pool nor velocity refuge habitats would be affected by implementation of any Baked Apple alternative.

Indirect and Cumulative Effects

Alternatives 2, 4, 5 and 6 possess slightly more risk of experiencing fire-related landslides that lack dead trees because the high-moderate slope stability areas were not assessed or removed from potential harvest areas in these alternatives. Landslides lacking wood

could result in the indirect effects to downstream aquatic environments of gaining sediment, but not gaining the important wood component. The harvest prescriptions in Alternative 5 that leave 50 percent of all size classes of dead trees would partially offset the potential of this indirect effect in Alternative 5. The actual risk of having landslides with no wood due to salvage of the dead trees has not been quantified; however the risk of such an event is considered to be low and small in scale depending largely on the winter weather over the next decade.

Alternative 3 is very unlikely to result in such an indirect effect because this alternative was designed to minimize the risks of landslides occurring without the dead tree component. Alternative 1 would not result in such an indirect effect since Alternative 1 would remove no dead trees anywhere.

Alternative 4 could potentially result in an indirect beneficial effect on the future condition of LWM in riparian areas and streams because it may result in potentially less riparian areas burned in the future compared to the other Baked Apple alternatives. The rest of the alternatives would be less likely to result in such a beneficial indirect effect.

Cumulative effects to the stream habitat elements are not expected under any alternative since the scope and scale of the potential direct and indirect effects associated with the Baked Apple projects are very limited and not likely be of a magnitude to result in a cumulative effect when added to other past, present and reasonably foreseeable actions.

REFUGIA

Affected Environment

Within the Panther Creek 6th field sub-watershed, Bachelor Creek has historically provided cooler water throughout the summer months to Limpy and Panther Creeks. In addition to the cool water, summer base flows are typically almost twice those emanating from Limpy Creek above the confluence with Bachelor, even though these two drainages are similar in size as measured upstream from this confluence. The cool water and sustained summer base flows from Bachelor combine to provide refuge habitat in the sub-watershed.

Past management has degraded overall stream habitats. Therefore, refugia is classified as 'at risk'. The short-term effects of the fire may also add to this risk rating. The combined conditions of temperature, sediment/turbidity, and substrate are major aspects of refuge habitats.

Environmental Effects

Direct, Indirect, and Cumulative Effects

No alternative would result in any direct changes in the nature of the refuge habitats in Panther Creek. Alternative 4 would treat a total of 233 acres in riparian reserves and would only remove timber from 32 acres of riparian reserve. No timber would be removed from within 180 feet of any stream channel. Upslope spring sources and other sensitive areas would be protected.

No indirect downstream effects to refugia in the North Umpqua River are expected under any Baked Apple alternative since the harvest of dead trees would not affect stream temperatures, peak flows, or appreciably affect sedimentation rates in Panther Creek. The cumulative effects to the stream habitat elements are not expected under any

alternative since the scope and scale of the potential direct and indirect effects are essentially nil.

Conclusions

Based on the above disclosure regarding stream habitats considered during conferencing with NOAA Fisheries, none of the Baked Apple alternatives would affect the physical integrity of the aquatic system including shorelines, banks, and bottom configurations (ACS objective 3) at the scale of the Panther Creek 6th-field. Moreover, none of the Baked Apple alternatives would appreciably affect recruitment of large woody material (ACS objective 8) and the habitats that are affected by the LWM (ACS objective 9 in Panther Creek). Finally, none of the Baked Apple alternatives would tend to cause any of the NOAA habitat indicators discussed above to be degraded as a result of implementation. Alternatives that result in the most riparian reforestation (Alternatives 2, 3, 4, and 6) contribute most to the long-term goal of ACS objects 3, 8, and 9 at the scale of the Panther Creek 6th-field watershed.

CHANNEL CONDITION AND DYNAMICS

Affected Environment

The Aquatic Conservation Strategy addresses the need to maintain and restore channel and stream bank conditions via objectives 3 and 8 and floodplain connectivity and inundation in ACS objective 7. NOAA Fisheries uses the assessment of three stream channel elements during conferencing for fish species that have the potential to be listed under the ESA. These channel elements discussed in this section are primarily affected by disturbance in the watershed that would result in both sedimentation and peak flow increases.

Width to Depth Ratio and Channel Type

Disturbance is usually expressed in a stream channel by channel adjustments that compensate for the disturbance. One type of channel adjustment is channel widening. Channel widening can occur when excess sediment enters the stream system; when flow levels are artificially increased; when riparian vegetation is removed; or when large wood is removed from the channel. In general, once these channels widen there is a significant reduction in fish habitat.

Past management has likely increased width to depth ratios in the Panther Creek sub-watershed causing this NOAA indicator to be 'at risk'. There is evidence of channel downcutting in many of the tributary channels and channel widening in some of the main stem channels. The 2002 Apple Fire has affected vegetative cover and would, thereby, affect peak flows. Stream beds and banks are well armored by bed rock, boulders, and cobbles and very stable. It is likely that some localized widening may occur in main stem channels, but over all width to depth ratios are not expected to change with any significance due to the fire.

Stream Bank Condition

Stream banks in the sub-watershed are generally well armored. Past management, however, has resulted in some active erosion of stream banks causing this NOAA indicator to be 'at risk'. There are several areas, particularly in Panther Creek and Fairy Creek that

have some areas of unstable stream bank. These areas appear to be management- and road-related such as the banks of Fairy Creek that are still affected by the debris flow that initiated off the 4703 road several decades ago. Limpy and Bachelor Creeks have well armored stream banks. Bed rock, boulders, and cobbles make up a preponderance of the stream banks here. Factors that can affect stream banks are the same as those that can affect width to depth ratios. Large wood has been added to stream channels throughout the planning area, which will help to ameliorate some of the stresses placed on the stream banks caused by the Apple Fire of 2002.

Floodplain Connectivity

Streams in the sub-watershed have been down cut and scoured and in many cases have lost their connection with the surrounding floodplain. ACS objectives 1, 2, 3, 6, 7, 8, and 9 focus on the maintenance and restoration of the complexity, physical integrity, and spatial and temporal connectivity within broad landscape areas and large watersheds. This NOAA indicator was considered to be 'not properly functioning' in the Panther Creek 6th field sub-watershed in the Middle North Umpqua Watershed Analysis (USDA, 2001).

Work that has been done since the Apple Fire has elevated this rating to functioning at risk. This is mainly due to the placement of large wood in Limpy and Bachelor Creeks. In addition, floodplain connectivity conditions are expected to improve over time as a result of the fire. More large wood will fall into stream channels trapping and storing more sediment. In turn, this is expected to aggrade the stream bed, and over time, reconnect the stream with its floodplain.

Environmental Effects

Direct Effects

There are no project activities that would directly affect channel width to depth ratios, stream bank conditions or floodplain connectivity. Only Alternative 4 proposes treatment within the riparian reserve; no harvest would occur within 180 feet of any stream channel, and at least a 75 foot or 50 foot no fuel activity buffer would be maintained on fish bearing and non-fish bearing streams respectively. None of the action alternatives, which only harvest dead trees, would increase peak flows or result in any landslides over and above those caused by the fire. Therefore, none of these stream channel indicators could be directly affected.

Indirect and Cumulative Effects

No downstream impacts are expected with the implementation of any Baked Apple alternatives on any channel conditions in the North Umpqua River; channel conditions in the North Umpqua River would remain unchanged.

The accelerated reforestation of riparian trees within the intensively burned (stand replacement) areas as a result of riparian tree planting under Action alternatives 2, 3, 4, and 6 may result in an indirect beneficial affect to future channel conditions. The conifers planted along streams as a result of these alternatives are expected to start providing important stabilizing functions at least a decade sooner than Alternative 1, which would not generate funds to plant riparian areas, or Alternative 5 which would rely solely on natural regeneration within riparian areas.

Cumulative effects to the stream habitat elements are not expected under any alternative since the scope and scale of the potential direct and indirect effects associated with the Baked Apple projects are very limited and not likely be of a magnitude to result in a cumulative effect.

Conclusions

Given the lack of impacts to these channel condition indicators, all Baked Apple alternatives are expected to maintain the current condition of the three habitat elements discussed in this section.

HABITAT ACCESS

Affected Environment

The maintenance and protection of the spatial connectivity within and between watersheds is the focus of ACS objective 2. This objective states, in part, that network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. NOAA Fisheries uses the assessment of physical barriers as the indicator for habitat access during conferencing on fish species that may become federally listed. This indicator focuses on barriers created with the road system.

Roads cross fish bearing streams at three locations in the planning area. These locations were inventoried in 2001 as part of a Forest-wide inventory of potential fish passage problems. An open-bottom arch crossing on Panther Creek at milepost 0.10 of road 4720 was found to possibly restrict some fish passage for early life stages. Steelhead and cutthroat are present upstream of the crossing, coho are not. The location is considered to be a natural barrier to coho, even without the road crossing. The road crossing may add to passage difficulties for juvenile fish of any species. Another open-bottom arch crossing on Fairy Creek at milepost 0.80 of road 4720 was found not to pose a barrier to fish. The third crossing is on Fairy Creek at milepost 1.40 of road 4720-005. The pipe arch located there was found to be a barrier to fish passage, although resident cutthroat trout inhabit the stream above and below the culvert. Steelhead trout are present below the crossing, but not upstream. This pipe restricts steelhead access to about 1/3 mile of habitat in Fairy Creek. The upper extent of coho distribution is approximately 2 miles down stream from this access barrier.

Road effects on aquatic connectivity of non-fish bearing streams was assessed with data from the Baked Apple stream crossing inventory that identified, whether crossings adequately emulated a natural streambed for aquatic organism passage. Of 173 stream crossings inventoried, 16 were found to emulate natural crossings without impact to aquatic connectivity. Those crossings had bottomless arches, fords, or at one site, a bridge. The remaining crossings are typically round metal culverts that do not retain gravel or other streambed material and may be considered to affect connectivity as a result. Seventeen culvert outlets are "perched," with a freefall of water to the streambed below, effectively preventing any accessibility for upstream movement of most aquatic organisms. Spatial and temporal connectivity of aquatic organisms such as salamanders within the Panther Creek sub-watershed are reduced by the condition of road-stream crossings.

Watershed analysis and subsequent assessments identified that passage through stream crossings is ‘properly functioning’ in the Panther Creek sub-watershed because all human made facilities in the watershed allow upstream and downstream fish passage at all flows for one-year old salmonids. Within the sub-watershed there are no culverts which currently block the upstream or downstream migration of adult fish. There are, however, culverts in the sub-watershed that block the free movement of juvenile fish less than a year old and aquatic salamanders or invertebrates.

Environmental Effects

None of the Baked Apple alternatives, including the no-action alternative, would either worsen or improve habitat access conditions. No alternative would result in any direct, indirect, or cumulative negative or beneficial effect to this indicator. Removal of stream crossing culverts and fills, or replacing culverts with streambed simulation type structures would restore some connectivity, but no such work is considered with any of the Baked Apple alternatives. Cumulative effects to the stream habitat elements are not expected under any alternative since the scope and scale of the potential direct and indirect effects associated with the Baked Apple projects are very limited and not likely be of a magnitude to result in a cumulative effect.

Conclusions

Given the lack of any effects on habitat access, all Baked Apple alternatives are expected to maintain the current condition of habitat access.

Summary of Aquatic Indicators Used in the NOAA Fisheries Conferencing Process

Tables 58 and 59 summarize the environmental baseline condition and the effects of implementing any of the Baked Apple Fire Salvage alternatives on the Panther Creek 6th Field Subwatershed and on the Middle North Umpqua 5th Field Watershed respectively.

Table 58. Environmental Baseline and Effects of the Baked Apple Action Alternatives on NOAA Indicators at the Scale of the Panther Creek 6th field Sub-watershed.

Environmental Baseline				Effects of Baked Apple Alternatives			
Relevant Indicators	Properly Functioning	At Risk	Not Prop. Functioning	Restore	Maintain	Degrade	ACS Obj
Water Quality							
Maximum Temp			X (1,3)		X		2,4,8,9
Sediment & Turbidity		X (1,2,3)			X		4,5,6,8,9
Chemical/ Nutrients		X (3)			X		2,4,8,9
Habitat Elements							
Physical Barriers	X (1)				X		2,6,9
Large Woody Material		X (1,2)			X		3,6,8,9
Substrate		X (1)			X		3,5,8,9
Pool Character		X (1)			X		3,5,6,9
Low Velocity Refuge		X (1,3)			X		1,2,3,6,8,9
Refugia		X (1,3)			X		1,2,9
Channel Condition and Dynamics							
Width/Depth Ratio		X (1)			X		3,8,9
Streambank Condition		X (1,2)			X		3,8,9
Floodplain Connectivity		X (1,2)			X		1,2,3,6,7,8,9
Flow/ Hydrology							
Changes in Peak/Base Flows			X (1,3)		X		2,5,6,7
Drainage Network			X (1)		X		2,5,6,7
Watershed Conditions							
Road Density			X (1)		X		1,3,5
Disturbance History			X (1,2,3)		X		1,2,3,5,8,9
Riparian Reserves		X (1,2)			X		1,2,3,5,8,9
Landslide Rates		X (1,2)			X		1,5

1 = Data from Surveys/Watershed Analysis; 2 = Data came from field review for a project; 3 = Professional Judgment; 4 = Data from Environmental Analysis or Environmental Impact Statement; 5 = Data from Water Quality Management Data/DEQ

Table 59. Environmental Baseline and Effects of the Baked Apple Action Alternatives on NOAA Indicators at the Scale of the Middle North Umpqua 5th Field Watershed.

Environmental Baseline				Effects of Proposed Action			
Relevant Indicators	Properly Functioning	At Risk	Not Prop. Functioning	Restore	Maintain	Degrade	ACS Obj
Water Quality							
Maximum Temp			X (1,3)		X		2,4,8,9
Sediment & Turbidity		X (1,2,3)			X		4,5,6,8,9
Chemical/ Nutrients		X (3)			X		2,4,8,9
Habitat Elements							
Physical Barriers	X (1,3)				X		2,6,9
Large Woody Material			X (1,2,3)		X		3,6,8,9
Substrate			X (1,3)		X		3,5,8,9
Pool Character		X (1,3)			X		3,5,6,9
Low Velocity Refuge		X (1,3)			X		1,2,3,6,8,9
Refugia		X (1,3)			X		1,2,9
Channel Condition and Dynamics							
Width/Depth Ratio	X (1)				X		3,8,9
Streambank Condition	X (1,2,3)				X		3,8,9
Floodplain Connectivity		X (1,2)			X		1,2,3,6,7,8,9
Flow/ Hydrology							
Changes in Peak/Base Flows			X (1,3)		X		2,5,6,7
Drainage Network			X (1)		X		2,5,6,7
Watershed Conditions							
Road Density			X (1)		X		1,3,5
Disturbance History		X (1,2,3)					1,2,3,5,8,9
Riparian Reserves			X (1,2,3)		X		1,2,3,5,8,9

1 = Data from Surveys/Watershed Analysis; 2 = Data came from field review for a project; 3 = Professional Judgment; 4 = Data from Environmental Analysis or Environmental Impact Statement; 5 = Data from Water Quality Management Data/DEQ

BIOLOGICAL EVALUATION FOR FISH AND AQUATIC SPECIES

The potential of increased sediment caused by the implementation of the Baked Apple project has been the focal point of this aquatic analysis. Panther Creek and its tributaries provides habitat for Oregon Coastal coho salmon as well as other sensitive anadromous and resident fish species. Current coho distribution is in the lower 1/3 mile of Panther Creek and the lower 1/3 mile of Limpy Creek.

Sediment, as a product of natural erosion following a disturbance event such as a fire, can originate from 3 major sources; surface erosion, fluvial erosion, and mass wasting. All of these sources of erosion are expected to increase under conditions found in the post fire sub-watershed. Across much of the sub-watershed the environmental baseline has been reset. Several factors directly affecting erosion under the new baseline are; changes in peak/base flow conditions, rain fall and snow fall interception, and effective ground and canopy cover. In addition, the sediment regime and routing has changed as a result of the 2002 fire.

Sediment is being produced and delivered by the existing network of roads in the planning area. Well maintained road surfaces with adequate and properly functioning drainage structures are less susceptible to erosion and will, therefore, supply less sediment to area stream channels.

Post-fire BAER activities within the sub-watershed have been implemented to help moderate the effects and magnitude of these factors. Road drainage has been improved, overly steep fills have been pulled back, stream crossings were improved or upgraded, and large wood was placed in impacted stream channels within the fire perimeter. Two hundred and eighty six acres of trees have been planted in the burn area, including 2 miles of riparian reserve along Limpy Creek.

Both short-term and long-term erosion processes were considered in this biological evaluation process. Surface erosion across the burned landscape is expected to be short lived. In less than 5 years, as ground cover increases and vegetation returns, surface erosion is predicted to return to background levels. By the summer of 2004 when logging would begin under the action alternatives, these buffers will have recovered substantial herbaceous vegetation along with hardwood sprouting to function as ground cover to help arrest the rain and gravity driven and rain driven movement of surface erosion before it enters streams. Road surface erosion will continue to occur in the sub-watershed. Post fire BAER work has addressed the high priority sites to reduce the potential for road surface erosion and road failure in the burned landscape. Road work associated with the salvage sale would include 2 reconstruction sites at stream crossings, some ditch and culvert cleaning, road blading, dust abatement, and a small amount of temporary road construction in all alternatives with the exception of Alternative 5. All of the planned temporary roads are located on ridge top sites and would be decommissioned after use.

The two reconstruction sites, in headwater channels, included in all action alternatives, would eliminate chronic sources of sediment. The short-term sediment delivery from reconstruction of these sites would likely be less than the currently existing rate of delivery without treatment.

The amount of timber that would be hauled from the salvage area varies by alternative. The risk of either an accident or increased road wear and potential sedimentation can increase as truck traffic increases. If an accident were to occur adjacent to a live stream

or riparian area there could be a direct input of petroleum products or dust abatement chemicals to the stream or to an area of soil. The cleanup activity that would remove contaminated soil could lead to more bare ground and surface erosion. Best Management Practices requiring that spill containment be readily available on the site and traffic control measures be implemented during harvest are incorporated into all action alternatives. These BMPs will lessen the risks of spills occurring and lessen the impacts if they do occur.

Alternative 5 likely has the lowest risk as it would require the fewest loads to be hauled. Alternatives 2, 3, and 6 have similar risks as they would require a similar number of loads. Alternative 6 requires the greatest number of loads hauled and therefore has the greatest risk. Due to road use mitigations that would be in place during sale activities the probability for an accident occurring would be low. Road maintenance and dry season haul would minimize the impact truck traffic would have on the road surface.

By following standards and guidelines for only minimal ditch blading, by not increasing the transport of sediment from ditches that flow directly into stream crossings, and by maintaining the proper function of road drainage surfaces and structures, road use associated with Baked Apple Salvage would not significantly affect the timing, volume, rate, and character of the sediment input, storage, or transport.

Fluvial erosion is expected to increase due to increases in peak flows as a response to the Apple Fire of 2002. Although an increase of fluvial erosion is expected it is not expected to be severe. The stable and generally well armored nature of the stream channels in the burn area are expected to keep this erosion to a minimum. The channels that are most likely to experience fluvial erosion are the first order streams (class IV channels). Large woody material placed in stream channels in response to the fire will help to reduce water velocity during peak flows and will trap, store and meter out sediments. In addition as vegetative ground cover recovers and trees are replanted and grow peak flows are expected to experience continued recovery. Alternative 5, of the action alternatives, likely retains the greatest risk of long-term fluvial erosion and increased peak flows as it replants the fewest acres of burned forest and retains the greatest amount of untreated forest fuels. The remaining action alternatives are expected to have similar recovery over time. Alternative 1, the No Action Alternative, holds the greatest risk for long-term fluvial erosion.

Salvage operations are not expected to increase fluvial erosion. Only Alternative 4 proposes entry into riparian reserves. There would be a total of 32 acres of harvest within the reserves in this alternative and would occur outside of 1 site potential tree height of any stream channel. Harvest is not expected to generate an increase in fluvial erosion because the susceptibility of a watershed to increased peak flows increases with the reduction of canopy cover. Effective canopy cover and ground cover were removed by the fire. Effective canopy cover would not be further reduced through the removal of dead trees. Large woody material placed in stream channels as a response to the fire will help to moderate the erosive power of elevated peak flows. Post salvage planting would hasten recovery and moderate peak flows over time.

Occurrences of mass wasting may increase over time as the roots of fire killed trees begin to decay and lose their ability to hold soils in place. The period of time when the risk for mass wasting is greatest is approximately 3 to 20 years after the burn. During this period of minimum root strength, soil reinforcement could be 20% to 40% of its undisturbed value. Post fire landslides that might mobilize into debris flows can only be expected if the winter weather is extreme enough to cause them. A spike in the number of landslides

would occur only if a substantial rain on snow winter storm follows a wet fall such as those that occurred during the winters of 1964 and 1997. If no such storm occurs during the period of diminished root strength, then no substantial increase in sedimentation associated with shallow-rapid landslides can be expected as a result of the Apple Fire.

Increased occurrences of mass wasting as a result of timber salvage operations are likewise not expected to occur. Tree boles do not add to soil reinforcement. Areas of high soil instability within the planning area have been removed from harvest consideration. Although this would not affect the rate of slides that might occur in those areas, it would allow the trees, should a slide occur, to become entrained in the slide and potentially provide wood to the stream as well as retain dislodged soils. Replanting trees in salvaged units will hasten the recovery of the sub-watershed. Alternative 4 represents the greatest risk, as it would remove some timber from areas with sensitive soils.

Fuels reduction would occur under all action alternatives (Table 6 in Chapter 2). Reducing forest fuels is an important aspect in the long-term health of the forest and the watershed. Past management has left much of the forest with higher than normal fuel loads. The fuels reduction associated with the Baked Apple Salvage sale have been designed to bring fuel loads back towards the natural range of variability. Without fuels treatments it is predicted future fires would burn hotter, be larger in size, and more frequent. Stream shade, peak flows, sediment regimes, and large wood could all be negatively impacted by future fires. The entire aquatic ecosystem in the sub-watershed could potentially endure setback after setback if fuels are not addressed.

Fuels treatments would not be expected to adversely impact the aquatic environment or current sensitive fish species habitat because only 202 acres of riparian reserves along class I and II channels would be treated. Treatment would consist of handpiling and fall burning under closely monitored moisture conditions. In addition there would be no treatment within the primary flood plain or within 75 feet of the stream channel, whichever is greater.

Oregon Coast coho salmon inhabit the lower 1 mile of the sub-watershed. It is believed that current coho habitat reflects historic coho distribution in the sub-watershed. The burn area extends through current coho habitat but was most intense up stream of it. Habitat conditions within the Panther Creek sub-watershed have been impacted by past land management activities. The Apple Fire of 2002 reset the environmental baseline across much of the sub-watershed. Post-fire BAER projects have reduced some of the risk the sub-watershed may face in the future due to the fire. Road drainage improvements, removing overly steep fills, improving stream crossings, some riparian and up land tree planting, and large wood placements have all added to the stability of the sub-watershed.

The implementation of the Baked Apple Salvage sale is not expected to further degrade the aquatic habitats in the sub-watershed. It is not expected to add to the cumulative effects already present in the Panther Creek 6th field sub-watershed and is not expected to show added cumulative effects in the larger North Umpqua 5th field watershed.

Determination of Effects

The biological evaluation is a 5-step process. Each Sensitive species potentially occurring within the project area was evaluated based on these steps. Evaluation of impacts on a given species may be complete at the end of step #1 or may extend through step #5 (Table 60). If the species' habitat is not present then no further review is necessary. Step 5, biological investigation, is not displayed. If data is insufficient to assess the

significance, a biological investigation would have been done, but such an investigation was not deemed necessary. The effects determinations displayed in the table below represent the alternatives presented in the EIS.

Table 60. Effects Determination for Sensitive Aquatic Species.

Review Process	Step #1 Prefield Review	Step #2 Field Recon	Step #3 Effects Determination	Step #4 Conclusion of Effects					
	Habitat Present	Species Present	Effects	Determination by Alternative					
Invertebrates				1	2	3	4	5	6
Mt. Hood primitive caddisfly	yes	unk	yes	NI	NI	NI	NI	NI	NI
Cascades apatanian caddisfly	yes	unk	yes	NI	NI	NI	NI	NI	NI
Tombstone Prairie caddisfly	yes	unk	yes	NI	NI	NI	NI	NI	NI
Alsea micro caddisfly	yes	yes	yes	NI	NI	NI	NI	NI	NI
Fish									
Oregon Coast coho salmon	yes	yes	yes	MIH	MIH	MIH	MIH	MIH	MIH
Oregon Coast steelhead trout	yes	yes	yes	MIH	MIH	MIH	MIH	MIH	MIH
Umpqua chub	no	no	no	MIH	MIH	MIH	MIH	MIH	MIH
Oregon Coast cutthroat trout	yes	yes	yes	MIH	MIH	MIH	MIH	MIH	MIH
*Oregon Coast chinook salmon	yes	yes	yes	MIH	MIH	MIH	MIH	MIH	MIH
EFH	yes	yes	yes	WNAA	WNAA	WNAA	WNAA	WNAA	WNAA

*OC chinook have not been documented in the Panther Creek sub-watershed but occur in the North Umpqua River.

Key to determinations:

Sensitive species determinations follow the nomenclature established in the Forest Service Handbook:

NI= no Impact;

MIH= May Impact Individuals or Habitat but will not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species;

WIFV= Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.

Essential Fish Habitat determinations follow the nomenclature established by NOAA Fisheries:

WNAA=Would Not Adversely Affect

Essential Fish Habitat (EFH) Under the Magnuson-Steven Fishery Conservation and Management Act (MSA)

The MSA requires Federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) identified under this law. The MSA defines adverse effects as any impact, which reduces the quality and/or quantity of essential fish habitat. Adverse effects include direct, indirect, site specific or habitat wide impacts, including individual, cumulative or synergistic consequences of actions. This law deals with commercial fisheries. Coho salmon are considered for this project.

The Baked Apple project (as mitigated) is expected to have a very low likelihood of causing an effect upon EFH, the species considered, and their major freshwater prey species. Major prey species are considered to be a variety of aquatic macroinvertebrates, including but not limited to the aquatic and winged adult phase of the following insect groups: stoneflies, mayflies, caddisflies, and midges. No substantial direct, cumulative, or synergistic effects to EFH are anticipated under the project. Coho salmon are found in the vicinity of the project planning area; however the chances of any effect being realized are limited in extent and duration and have been determined as 'Would Not Adversely Affect' EFH.

Although the sensitive species determination calls for Oregon Coast coho salmon, steelhead and cutthroat are the same for each action alternative, the potential risk within the range of the MIIH call associated with each alternative varies (Table 61).

Table 61. Ranking the Risk Associated With Each Alternative within the Range of the Effects Determination.

Alternative	Risk Ranking (greatest=1 lowest=6)	Rationale *pros/cons
1 (No Action)	1	Would not further disturb the landscape / Watershed left to recover on its own, fuels not addressed, fire risk remains elevated and increases through time, minimal planting would prolong recovery, short-term effective ground cover not addressed with added logging slash, FS road 4714 reconstruction sites not addressed.
5 (Retention of Snags, Large Wood, Ecosystem Recovery, and Low Road Density Areas)	2	Would minimize disturbance to the burned landscape / Fuel levels remain high, fire risk remains elevated and increases through time, Minimal planting prolongs recovery, no riparian acres planted.
4 (Economics, Fire Risk, and Future Fuel Loads)	3	Enters outer portion of riparian zone to lessen risk of future reburns, greatest amount of fuel reduction overall / Greatest amount of haul over forest roads, generating the greatest risk of accident and spill.

Alternative	Risk Ranking (greatest=1 lowest=6)	Rationale *pros/cons
6 (Restoring and Maintaining Landscape Patterns)	4	Reduces fuels across 917 acres, protects unstable soils.
2 (Proposed Action)	5	Replants greatest amount of harvested area, includes greatest amount of helicopter harvest systems, addresses forest fuels, protects unstable soils.
3 (Sediment and Site Productivity)	6	Removes high and moderately unstable ground from harvest consideration, greater than 50% helicopter harvest systems used, addresses forest fuels.

SOCIAL ENVIRONMENT

ECONOMICS - TRACKED AS A SIGNIFICANT ISSUE

Affected Environment

During scoping, it was determined that the proposed use of helicopter logging may result in low or no returns to the treasury or may not be economically feasible. In addition, helicopter logging may not attract a bidder to the timber sale. Net present value and benefit/cost ratio are the indicators used to compare the direct effects of the alternatives, as these are the standard criteria used to measure economic efficiency.

Economic effects to the local economy are estimated using an economic input/output model developed with IMPLAN Professional 2.0 (IMPLAN). All data used in the model preparation is 2000 information⁵⁸, the latest available.

Assumptions

Douglas County, Oregon is the analysis area used for the model and other assumptions and outputs. Most timber sales from the North Umpqua District are purchased and operated by individuals and companies based in this county. Douglas County has a full array of logging contractors and milling facilities. Final demand is assumed to be wood products ready for shipment at the mill yards.

Timber values were derived using the most recent historical average logging costs and delivered log prices compiled by the Oregon Department of Forestry. Log prices are reduced by the value of the chip and fiber components due to char. Charred logs are not suitable for most chip products. Helicopter logging costs were developed using Helipace, a joint Forest Service/helicopter industry model. Most costs and values are measured per thousand board feet (MBF).

Fire-killed timber undergoes physical deterioration and decay quickly, although studies to quantify the causes and rates of volume loss are few. The two primary defects that result in scale deductions are weather checks and sap rot. The vegetation section in this chapter describes the wood deterioration expected to occur. Those assumptions are used here.

Douglas County's Economic Situation

Total employment in Douglas County is hard to quantify. The Oregon Labor Market Information System (OLMIS) lists employment in 2000 at 37,751 while the U.S. Census Bureau's 2000 Census lists 41,746. Both of these estimates are significantly less than the IMPLAN 2000 employment number of 54,047. The IMPLAN data includes all workers, full and part-time, and self-employed people. As a result of these differences, percentages and relative differences are used for analysis where possible instead of absolute numbers.

Douglas County has attempted to diversify its economy in recent years as the timber industry situation has declined. However, the county continues to be heavily dependent on forestry and the wood products industry for primary employment. The wood products sector provides 16.6% of the area's employment, and 29.7% of the overall industrial output, according to the IMPLAN data. Table 62 shows some of the major sectors of the

⁵⁸ Data sources and IMPLAN database construction methods are discussed in detail in the Data Guide, 2nd Edition, June, 2000, on file at the Diamond Lake Ranger District office.

local economy, and how each one contributes to the economic picture, based on 2000 IMPLAN data.

Table 62. Douglas County Economic Sectors

Industry	Total Industry Output *	Employment # Jobs	Average Employee Compensation **
Forestry/Wood Products	1295.605	8,954	\$34,683
Wholesale & Retail Stores	371.728	9,257	\$16,174
Construction/Maintenance	336.152	2,999	\$25,655
Real Estate	365.169	1,412	\$ 6,786
Fed, State, Local Government (non-education)	280.624	4,744	\$42,635
Personal & Business Services	158.689	3,537	\$13,687
Banking	116.117	730	\$34,264
Recreation & Entertainment	75.208	2,399	\$10,641
Communications	33.582	199	\$33,211
Utilities	62.011	195	\$53,492
Electronic & Electronic Manufacturing	8.390	34	\$54,343
Trans. Manufacturing	44.026	338	\$32,360
Farming/Ranching	38.233	1,864	\$ 8,269
Hotels & Lodging	18.860	496	\$11,934
Engineer & Architect Services	12.521	168	\$17,298
Legal	11.794	175	\$24,699
Mining	6.930	45	\$ 9,161
Nonprofit, Business, Labor Organizations	14.209	612	\$16,209
Totals	3249.848	38,158	\$25,091

* Million Dollars

** Includes total payroll costs and benefits.

The trends in employment show a shift from logging and wood products manufacturing toward retail sales and service sectors (Stevenson 2001). The average wage paid in these sectors, however, is much less than the timber and wood products average wage (see Table 62). Average earnings per job, in real dollars, have dropped from \$31,080 in 1970 to \$25,724 in 2000 in Douglas County (Sonoran 2003).

Total mill capacity in Douglas County stands at 760 million board feet (mmbf) per year according to Robert Ragon, Douglas Timber Operators Executive Director. Recently, local mills have increased log imports from Canada and travel further for raw log supply. In addition, two mills have closed within the last 3 years with a capacity of 283,000 cubic meters, or about 18.3 mmbf (Spelter 2002). Reduction in timber available from Federal land is given as one factor for these actions.

Of more recent concern is general unemployment in the county, which is estimated at 9.2% for July 2003, the highest rate in Oregon. Large layoffs from two local mills occurred in the spring of 2003, with another round of layoffs expected in October 2003. These

layoffs are related to the general slump in wood products and specifically to the reduction in the plywood market due to imports of Canadian and southern U.S. products (oriented strand board).

Environmental Effects - Economic Analysis Discussion

Net Present Value & Benefit/Cost Analysis (Efficiency Analysis)

Forest Service planning costs are not included in the benefit/cost (B/C) analysis since they are considered sunk costs (OMB A-94). Table 63 displays the planning costs that are fixed for all alternatives.

Table 63. Forest Service Planning Costs

Cost Center	Non-Discounted Cost
ID Team	\$352,000
Fields Surveys (all types)	\$95,000
Document Production	\$10,000
Forest Overhead (34%)	\$155,000
Total	\$612,000

The results of the direct benefit/cost analysis by alternative are displayed in Table 64. The standard criterion for deciding whether a government program can be justified on economic principles is net present value (NPV), or the discounted⁵⁹ monetized⁶⁰ value of expected net benefits (OMB A-94). The result of the analysis shows that NPV is correlated positively and proportionally with the amount of timber volume harvested. Alternative 4 has the highest NPV and Alternative 5 has the lowest, actually a negative NPV. This indicates Alternative 5 is not economically sound, even with several Knutson-Vandenberg (KV) sale area improvement projects dropped. If no additional KV work other than required reforestation and mitigation were included, the NPV for Alternative 5 would be \$448,877, the lowest alternative. Alternative 5 was not eliminated from detailed study since the KV expenditures are discretionary and a positive NPV may be realized.

Stumpage is the value of the timber “on the stump.” It is the timber sale contract minimum value and is determined by subtracting logging, road work, and slash disposal costs from the delivered log price. Timber sale purchasers may bid more than the minimum in a competitive auction. The actual monetary return to the U.S. Treasury is determined by subtracting all post sale costs from the stumpage. Figure 68 displays Net Present Value and the return to the U.S. Treasury by alternative.

⁵⁹ Discounting is the process of calculating the present value of a future amount of money.

⁶⁰ Monetized means expressing in terms of money.

Table 64. Economic Efficiency Analysis

	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
Timber Volume (MBF)	44,938	31,364	49, 883	5,037	41,488
Acres by Harvest Method					
Helicopter	601	455	413	0	305
Skyline	443	395	644	241	562
Loader	30	30	200	194	50
Total Acres	1,075	880	1,257	435	917
Volume (MBF)/Acre	41.8	35.6	39.6	11.6	45.2
Total Present Benefits					
Gross Benefit	\$21,548,198	\$15,042,350	23,891,199	\$2,297,255	\$20,228,537
Value/MBF	\$480	\$480	\$479	\$456	\$482
Value/Acre	\$20,045	\$17,094	\$18,871	\$5,281	\$21,704
Total Present Costs					
FS Prep & Admin	\$952,472	\$670,509	\$902,822	\$111,933	\$881,702
Logging	\$9,712,035	\$7,050,668	\$9,468,508	\$1,212,166	\$8,026,207
Slash Disposal	\$690,513	\$550,118	\$687,045	\$270,444	\$535,514
Road Work	\$179,949	\$140,278	\$176,370	\$63,399	\$122,597
KV Reforestation	\$808,075	\$657,041	\$1,011,160	\$187,726	\$744,931
KV Sale Area Improvements	\$1,647,820	\$1,419,940	\$1,448,920	\$517,449	\$713,441
Total Cost	\$13,864,287	\$10,382,190	\$13,694,825	\$2,365,827	\$11,204,410
Cost/MBF	\$309	\$331	\$274	\$470	\$263
Cost/Acre	\$12,897	\$11,798	\$10,817	\$5,439	\$11,829
Net Present Value	\$7,683,912	\$4,660,161	\$10,196,374	-\$68,573	\$9,204,127
NPV/MBF	\$171	\$149	\$204	-\$14	\$219
NPV/Acre	\$7,148	\$5,296	\$8,054	-\$158	\$9,876
Stumpage	\$10,965,701	\$7,301,287	\$13,559,276	\$751,245	\$11,554,219
Return to the Treasury	\$8,636,383	\$5,333,379	\$11,099,195	\$46,069	\$10,085,847
B/C Ratio	1.55	1.45	1.74	0.97	1.83

Alternative 4 has the highest net present value and return to the U.S. Treasury. In terms of per-unit NPV, alternative 6 is more efficient, primarily due to higher volume per acre cut and lower KV-funded sale area improvements.

An economic risk for all alternatives is posed by the deterioration of timber through time as described previously. A worst-case analysis, assuming a delay of one year in operations, would result in a reduction in total volume of about 43%, with a corresponding reduction in volume per acre, one of the main factors in logging costs. These conditions would produce some deficit sales that would cost a prospective purchaser more than the timber is worth. NPV would be reduced from 48% to 60%. Alternative 5 would clearly be uneconomical to log, with an estimated logging cost per acre of about \$396. The indicated stumpage at this level would mean a loss of about \$153,000 to the purchaser.

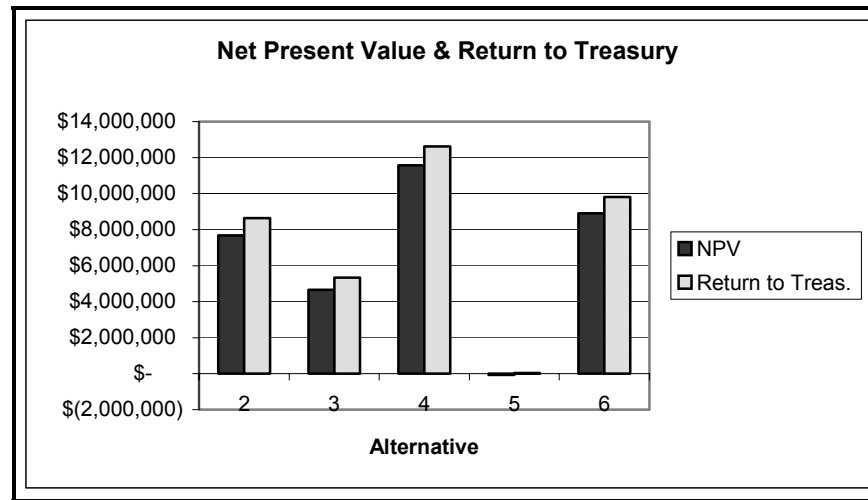


Figure 68. NPV & Return to Treasury

Another source of uncertainty is the delivered log price at the time of sale auction. This directly affects the stumpage, the amount of funds available for KV sale area improvement, and the return to the U.S. Treasury. Values fluctuate throughout a typical year depending on supply, weather, housing starts, and many other market conditions. The 4th quarter is typically the lowest in the year due to plentiful supply, good logging weather, and the typical end of the housing start cycle. Table 64 and Figure 68 reflect values derived from 2002 4th quarter prices, derived from local sources.

An analysis of representative local delivered log prices over the last 3 years shows a general decline of about 1.4% per year. In 2002, however, the prices stabilized and have moved higher the last 4 quarters. If a 1.4% decline from 4th quarter 2002 prices is assumed to establish a low bound for comparison, the NPV for each alternative would be as shown in Table 65.

Table 65. Effect of Log Price Decline on NPV

	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
NPV @ 4 th Qtr 2002	\$7,683,912	\$4,660,161	\$11,570,831	-\$68,573	\$8,903,469
NPV @ 1.4% Decline	\$7,382,240	\$4,449,488	\$11,190,086	-\$100,747	\$8,613,445
Difference	-\$301,672	-\$210,673	-\$380,745	-\$32,174	-\$290,024
Percent Difference	-3.93%	-4.52%	-3.29%	-46.92%	-3.26%

The effect of this log price decline is relatively minor, compared to the potential loss of value from delayed logging. To remain economically viable, Alternative 5 would do less KV sale area improvement work. Overall, benefit/cost ratio is generally positively correlated with total volume harvested and volume per acre harvested. In this analysis, logging cost per thousand board feet (MBF) is the main variable directly correlated with B/C. Logging costs are influenced primarily by the volume per acre and the logging system. Figure 69 shows this relationship by alternative.

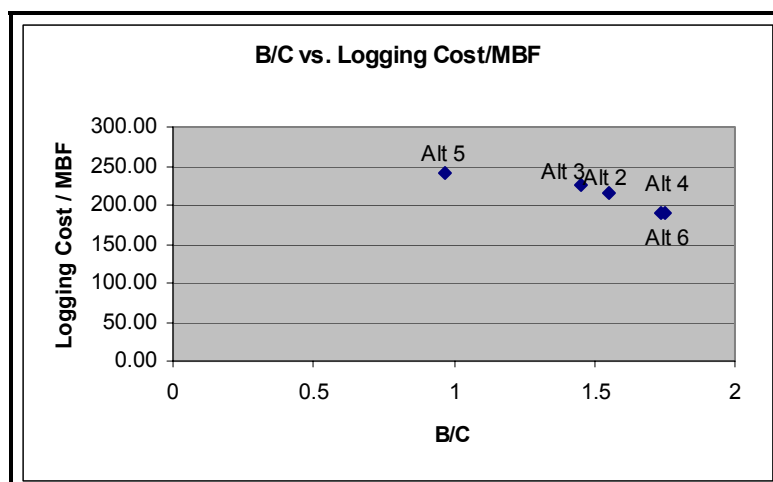


Figure 69. Logging Cost vs. B/C

In summary, Alternative 4 provides the highest Net Present Value and return to the U.S. Treasury of all the alternatives, in all of the potential scenarios of volume and value loss. Conversely, Alternative 5 has a negative NPV and the smallest return to the U.S. Treasury of all the alternatives. The sensitivity analyses for loss of volume, decline in value, and change in discount rate do not change the relative differences significantly.

Economic Impact Analysis

Direct and Indirect Effects:

The economic impact analysis using IMPLAN looks at changes in employment and income due to changes in the economic activity of the area from each alternative. In past periods of non-declining, even-flow of timber from federal land, an individual timber sale may not have significantly changed the overall economic activity of the county, since the total amount of volume would be sold each year. The conditions today and into the foreseeable future are not the same. The Umpqua has not sold a consistent level of volume, or levels approaching the potential sale quantity (PSQ) in the Forest Plan since 1990. Therefore, new timber sales can be treated as an actual increase in the raw material available for local industry, allowing an increase in production up to the full level of mill capacity.

The effect on log supply and prices of selling all of the SW Oregon fire salvage sales (Biscuit Salvage, Ash Salvage, Acker Salvaged and Baked Apple Salvage) within one or two years cannot be easily predicted. Log prices and supply are dependent on complex market conditions extending well beyond the local area and are a function of end-product demand as well. An increase in local supply, however, would generally equate to a decrease in imported logs (from outside of the local area) and a reduction in overall raw material price. This still would indicate a positive economic impact to the local area.

Table 66 displays the results of the economic impact analysis by alternative. In general, the increase in timber volume to the local economy would result in increased local employment in the logging and wood products manufacturing sectors, increases in forestry services (slash treatment, planting, etc.), and indirect and induced increases in many

other sectors. The business taxes paid to Federal, State, and local governments would also increase.

Other direct, indirect, and induced benefits derive from road reconstruction and maintenance and KV funded mitigation and enhancement work. These work activities are treated as costs in the benefit/cost analysis since they reduce the revenue to the Treasury, but they have economic benefits to the local community since most are contracted services. These benefits are included in the economic impact analysis and in the numbers reported in Table 66. Spreadsheets developed from IMPLAN outputs show the complete analysis by sector and subsector and are available at the district office.

The numbers in Table 66 are not intended to be absolute. The analysis is used to compare the relative differences of the alternatives. The value of each activity included in the impact analysis was estimated from the cost and benefit analysis spreadsheets. An estimate was made of the percent of each activity's value that would be spent locally. The value to the wood products manufacturing sector was estimated to be 40% of the delivered log price, reflecting the difference between end product value and log cost to the mill. This difference can be widely variable based on mill efficiency and the choice of end products, but it approximates the value given for all of Oregon in 1998 (Gebert et. al. 2002). The percentage of value assigned to sawlog and veneer production is 75% and 25%, respectively, based on the 1998 data.

Table 66. Economic Impact Analysis

	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
% of Area Mill Capacity	5.9%	4.1%	7.5%	0.7%	5.7%
Change in Total Industry Output	+\$22,101,200	+\$20,056,100	+\$28,195,500	+\$3,523,100	+\$21,352,800
Change in Employment	+217	+195	+274	+40	+206
Change in Employee Income	+\$5,839,400	+\$5,243,000	+\$7,452,600	+\$897,000	+\$5,650,700
Change in Proprietor Income*	+\$1,199,000	+\$1,034,100	+\$1,475,000	+\$287,000	+\$1,091,300
Change in Other Property Income**	+\$3,090,200	+\$3,015,300	+\$3,970,100	+\$519,800	+\$3,008,700
Change in Indirect Business Taxes***	+\$543,900	+\$482,000	+\$689,700	+\$91,500	+\$520,700
Change in Value Added	+\$10,672,500	+\$9,774,400	+\$13,587,400	+\$1,795,300	+\$10,271,500

* Proprietor income consists of payments received by self-employed individuals, such as private business owners.

** Property income consists of payments for rent, royalties, dividends and corporate profits.

*** Indirect business taxes consist of excise and property taxes, fees, licenses and sales taxes paid by businesses.

The No-Action Alternative is not shown in the table since it does not change the conditions or level of economic activity in the county. This alternative would, however, contribute to the decline in the local timber industry, since it would not change the federal timber available over time, or the available associated contracts. Some reforestation is

predicted to occur under the No Action Alternative, but the impact of those contracts to the overall economy would be negligible.

The values displayed in Table 66 are correlated with NPV and the total amount of volume harvested. Alternative 4 would provide the most positive impact to the local economy, and Alternative 5 would provide the least positive impact of the action alternatives.

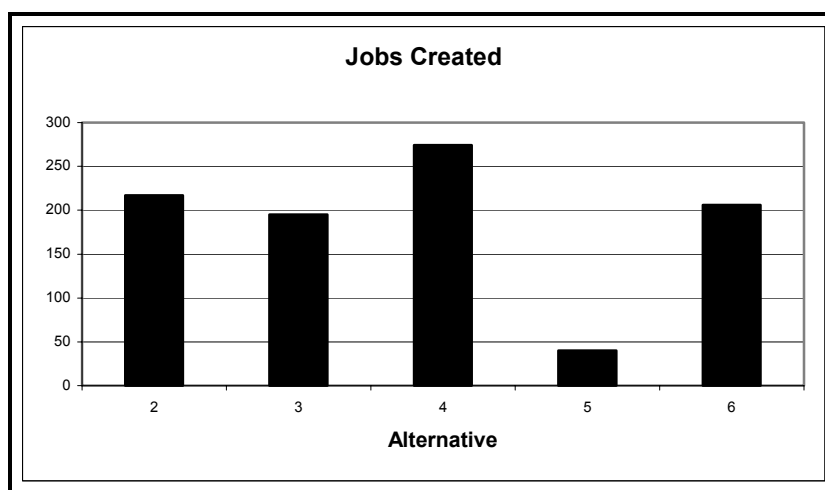


Figure 70. Jobs Created by Alternative

Figure 70 highlights the number of local jobs created or sustained by each alternative. These are total jobs, including direct jobs in logging, milling, and forestry services, indirectly created jobs through timber industry spending in the county, and induced jobs created through the cycling of dollars throughout the economy. The average for all alternatives shows direct job creation is about 54% of the total, indirect jobs are about 19%, and induced jobs are about 27%.

A question was raised during scoping about the potential for skill shortages in the local area if timber harvest levels are increased. This question can best be answered by comparing the potential job creation in specific industrial sectors with the existing workforce. Table 67 displays the primary sectors where jobs would be created, the current workforce (in 2000) in those sectors, the number of jobs created by each alternative, and the percentage that represents of the current employment level.

Table 67. Primary Sectors for Job Creation

Sector	Name	Current Jobs	Jobs				
			ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
26	Ag, Forestry, Fish Services	623	42 6.7%	35 5.6%	50 8.0%	14 2.2%	36 5.8%
133	Logging Contractors	1,211	40 3.3%	50 4.1%	53 4.3%	7 0.6%	40 3.3%
134 & 139	Sawmills & Veneer Mills	4,768	47 1.0%	33 0.7%	59 1.2%	5 0.1%	45 1.0%

Given that current unemployment is 9.2% of the available workforce, and assuming that unemployment by sector is proportional with the current workforce, it appears that the skills are present in the local area to fill jobs created by the proposed alternatives. Unemployment in the wood products sector in Douglas County may actually be higher than the average by sector, indicating that needed skills are available.

Cumulative Effects:

During the DEIS comment period members of the public asked about the potential effects of the cumulative increase in the local supply of logs if all of the fire salvage were to be put on the market at the same time. These fire salvage sales include, but aren't limited to: Baked Apple, Ash, Acker, Biscuit, Timbered Rock, Kelsay, and Molasses. The total volume in these salvage sales may be as much as 600 mmbf, an amount equal to about 80% of the total mill capacity of Douglas County.

The primary effect of a sharp increase in local supply would be a decrease in imports from Washington, other states, and Canada, resulting in a decline in delivered log prices to Douglas County mills. As stated in the previous section, the effect on log supply of selling all of these sales cannot be easily predicted. This is due to a number of uncertainties.

1. Existing contracts for logs that must be honored, some time-constrained.
2. Lawsuits and appeals of pending decisions on fire salvage sales. There is a high probability that some of the potential salvage volume will not be offered.
3. Reduction in volume and value due to wood deterioration.
4. Availability of logging contractors, especially helicopter loggers.
5. The overall log market, tied to national and global economies.

Since most of these factors are beyond our ability to predict accurately, log price decline must be described in terms of risk and probability. This analysis predicts the average log price where an individual timber sale would be deficit, and where the Net Present Value (NPV) of each alternative would be zero. The amount of money available for KV projects is estimated at each of these log prices.

ASSUMPTIONS

Two log prices are targeted in this analysis:

1. Average log price where each sale would become deficit.
2. Average log price where NPV for the alternative as a whole is zero.

Each sale in each alternative is analyzed in a residual value appraisal to determine these figures. KV requirements are reduced to required reforestation and mitigation costs. The only other required mitigation listed in the DEIS and in the FEIS is snag falling for down moody material needs.

Table 68. Average Log Prices

	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
DEIS Predicted Log Price	\$492.46	\$492.55	\$491.55	\$468.39	\$494.93
Log Price - All Sales Non-deficit	\$262.50	\$277.44	\$235.62	\$358.12	\$232.79
% Decline from DEIS	46.7	43.7	52.1	23.5	53.0
Log Price where NPV=0	\$316.86	\$339.97	\$281.77	\$482.38	\$252.98
% Decline from DEIS	35.7	31.0	42.7	(Incr.) 2.0	48.9
Reforestation & Mitigation KV required	\$886,215	\$720,615	\$1,106,400	\$206,085	\$816,885

The second step in the analysis is to evaluate the probability that log prices will decline to these levels based on market forces. Historical prices were analyzed from the State of Oregon log price web site. Figure 71 displays the average delivered log price by year since 1977 (1st quarter prices) using the species mix percentage in Alternative 4. These prices have not been adjusted for inflation. The solid line shows a theoretical price trend with an assumed inflation rate of 4%. The real price trend has been down over the last 10 years from the highest level in 1993. That year marked the severe downturn in federal timber offered for sale due to the spotted owl lawsuit.

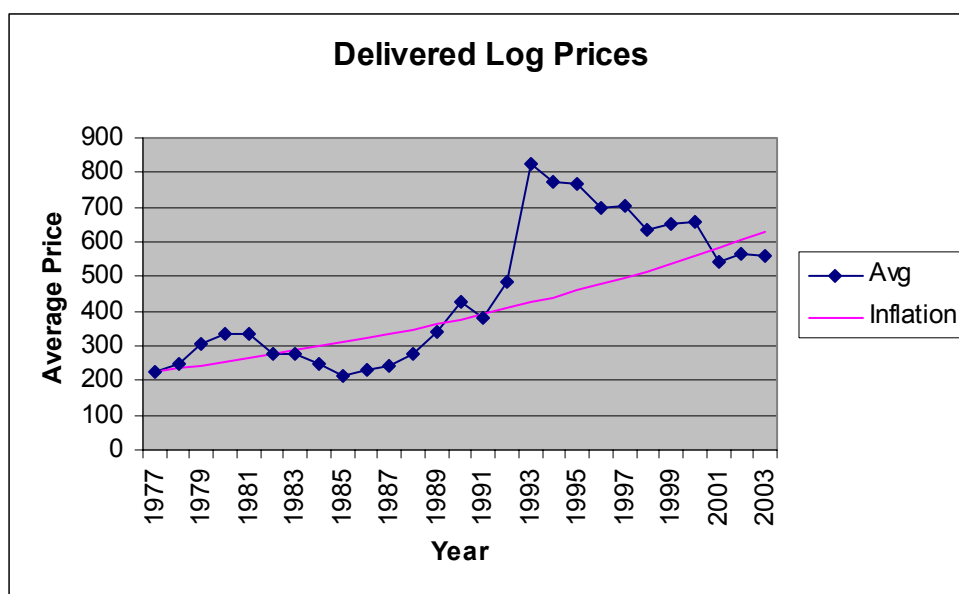


Figure 71. Average Delivered Log Price

Alternative 5 is the only alternative that is close to being in jeopardy from lower log prices. It currently has a negative net present value, and would fall further in negative territory with any price decline.

The probability of log prices falling to the levels of the mid-1980's is low, based on expected overall market levels. Therefore, the probability of deficit sales and negative

net present value due to log price decline from market forces is low. Alternative 6 has the least chance of suffering deficit conditions due to log supply driven price declines.

RECREATION

Affected Environment

Numerous recreation sites occur in or around the planning area, including two developed and four dispersed camping sites. The two developed sites within the planning area include the Panther Creek Trailhead and Fairy Shelter. Panther Creek Trailhead is the access point to the 3.7 miles Calf segment of the North Umpqua Trail, which also resides in the planning area. This segment is currently closed due to fire damage and safety concerns. The Panther Creek Trailhead also provides access to the 5.0 mile Panther segment of the North Umpqua Trail to the west (hikers, mountain bikers, and equestrian riders use the North Umpqua Trail.) The historic Fairy Shelter, located in the headwaters of Bachelor Creek, is a three-sided pole structure with a cedar shake roof.

The North Umpqua Wild and Scenic River lies to the north of the area being proposed for harvest. The Congressionally withdrawn area is variable and includes those lands found within ¼ mile from either side of the North Umpqua River. The fire burned along the river, producing a patchwork of dead and dying conifers with most of the understory removed. All proposed harvest units are outside the area withdrawn for the Wild and Scenic River.

Environmental Effects

Direct, Indirect, and Cumulative Effects:

None of the action alternatives propose harvesting adjacent to the four dispersed camping sites or the two developed sites; therefore, there would be no direct effect to the actual camping sites. There is the potential of an indirect effect of implementing the action alternatives in the form of disturbance to campers, if they were using the dispersed or developed sites while logging or logging related activities were occurring, which may last up to 5 years. Alternative 5 would cause less disturbance, as it harvests the least amount of volume, followed by Alternatives 3, 6, 2, and 4. The no action alternative would create minimal disturbance, which would be associated with on-going maintenance activities and reforestation efforts that are planned to occur. Following the logging and post-logging operations, ongoing maintenance activities would occur and recreation use would likely return to pre-fire levels. No cumulative effects to recreationists are expected to occur from these actions.

HUNTING

Affected Environment

Hunting takes place throughout the planning area during the fall and winter seasons. Hunters pursue black tailed deer, black bear, cougar, Roosevelt elk, and upland game birds during the time seasons are open for hunting. The fire created large openings that will revegetate over time.

Environmental Effects

Direct, Indirect, and Cumulative Effects:

The areas that burned at the highest intensity during the 2002 Apple Fire would see an increase in forage as areas begin to revegetate under all of the alternatives. Direct effects of the proposed activities would accelerate reforestation efforts; trees not protected by plastic tubes would be available forage for big game and upland bird species. Removal of the dead trees would result in a decrease in hiding cover. Burning activities would likely set back vegetative regrowth. Overall, hunting success for big game and upland birds may increase in the short term, but would decrease as the reforested areas mature.

Increased forage for bears would also occur as species with berries revegetate. Abundant snags would provide denning opportunities, especially near forest edges where they can seek cover. Overall, hunting success for bear may also increase in the short term. Cougar populations may rise as big game populations increase, which may also lead to an increase in hunting success.

VEHICULAR ACCESS

Affected Environment

Highway 138 is a nationally designated scenic byway and a major travel route for recreationists visiting Diamond Lake and Crater Lake National Park. Recreationists traveling within the planning area view landscapes of dead and dying conifers within a coniferous forest. The alternatives retain varying amounts of trees, and range between retaining 4 trees per acre to retaining 50% of the standing trees. Within the planning area, 80% to 93% of the area that burned would remain unharvested under the action alternatives.

Once the area starts to reforest and the blackened scenery once again turns to a shade of green, forest users within the area can enjoy viewing young forests growing, where fire-scarred vegetation once dominated the viewshed.

Recreationists traveling in the planning area have the opportunity to utilize a travel loop which is approximately 25 miles in length and takes around two to three hours to drive. The travel loop consists of roads 4720 to 4720-005 to 4720-760 and back to road 4720. Multiple short dead end roads along the route provide additional roads to explore. At present, the route is dominated by the view of burned landscapes. With time the route will again provide views of young and old forests with pockets of aging snags.

Environmental Effects

Direct, Indirect, and Cumulative Effects:

All alternatives maintain the existing travel routes used by the recreationists, so harvesting along the routes would only restrict seasonal recreational use of the dispersed camping sites and recreational driving for a short duration while logging is occurring. Short term impacts to access under Alternatives 2, 3, 4, 5, and 6 would occur when the 4714 road is repaired. The no action alternative would have no affect on vehicular access; road maintenance activities and hazard tree felling would continue as part of ongoing maintenance.

VISUALS

Affected Environment

The planning area was inventoried for visual quality during the development of the 1990 Umpqua NF land and Resource Management Plan. Please see the visual quality report (incorporated by reference), which is located in the Project Record, for a complete description and definition of the visual quality objectives for the Forest. The inventory identified the following Forest Plan Standards and Guidelines (IV-19 to IV-26) for visual quality objectives:

- The section of the North Umpqua Wild and Scenic River and Highway 138 within the planning area has a visual quality objective of foreground retention with a sensitivity level one; these areas are to remain naturally appearing.
- Other areas outside the Wild and Scenic River boundary that are seen from Highway 138 are mapped as middle ground retention sensitivity level one.
- Areas within the planning area along Forest Service RD 4714 are background modification sensitivity level two.
- All other areas in the planning area are background maximum modification sensitivity level three.

The 2002 Apple Fire burned down to the North Umpqua River and can be seen from along Highway 138. The area is rapidly resprouting and green shrubs can be readily seen from the highway. In the middle ground and background views, burned snags are readily apparent.

Environmental Effects

Direct, Indirect, and Cumulative Effects:

All proposed harvest units are in the inventoried modification or maximum modification visual quality objective (VQO), except for a portion of Unit 44, which is harvested under Alternatives 2, 3, 4, and 6. Unit 44 can be seen from State Highway 138 and would require mitigation of the harvest prescription to meet the required middle ground retention VQO. The seen portion of Unit 44 can be viewed from a vehicle traveling east on State Highway 138 for approximately 7 seconds at a speed of approximately 50 MPH. The view is focal (very visible) and is within 1.5 miles of the highway. By retaining 70% of the trees in all alternatives, management activities would not be evident and there would be no direct, indirect, or cumulative effects to the VQO of Unit 44. In the proposed salvage units that have a modification and maximum modification designation, human activities may dominate the characteristic of the landscape, but should appear as a natural occurrence when viewed as background.

Proposed harvest Unit 62D, which is harvested under all action alternatives, and the helicopter landing located upslope and to the east on Road 4720, which is associated with Alternatives 2, 3, 4, and 6, would require close adherence to the mapped retention area located just upslope from the unit boundary. The area seen from Highway 138 would be harvested only as mitigation to protect workers at the landing located in the existing rock pit. No harvest would occur below Rd 4720 in Unit 62D that can be viewed from Highway 138. Harvest would be permitted for those trees which are located down slope of the ridge that lies to the northwest and blocks the view from Highway 138. A recreation staff

person would need to assist in the marking of the unit boundary to verify visual quality objectives are met after layout and harvest of Unit 62D.

The silvicultural prescriptions meet the visual quality standards as 4 to 12 trees per acre or more are left after harvest is complete in all action alternatives. This area also meets salvage Visual Quality Objectives that are allowed in any distance zone. The no action alternative would have no effect on visual quality objectives in the area. All alternatives, as mitigated, are consistent with Forest Plan Standards and Guidelines.

LOW ROAD DENSITY AREAS - TRACKED AS A SIGNIFICANT ISSUE

Oregon Natural Resources Council (ONRC), Umpqua Watersheds, the Wilderness Society, the Oregon Chapter Sierra Club, and Cascadia Wildlands Project submitted comments during scoping regarding the effect of the proposed project on uninventoried roadless⁶¹ areas. According to ONRC, portions or all of two uninventoried roadless areas exist within the project area; the 1,300 acre Limpy Creek and 1,680 acre Horseshoe Bend uninventoried roadless area. ONRC provided the GIS files of each area; all analysis is based on their maps, which have not been field verified. The Middle North Umpqua Watershed Analysis (USDA 2001) identified the Limpy Creek headwaters as a low road density area. These groups indicate that these areas provide habitat for a variety of species and offer solitude for human communities. The indicators selected to measure the impacts of the alternatives on this issue are acres salvaged and miles of temporary road constructed/reconstructed within the low road density areas; these indicators help measure the impact on the character of these areas.

Protection of inventoried roadless areas falls under the Forest Service Roadless Rule, effective March 13, 2001. However, continued legal challenges and a currently proposed settlement have delayed full implementation of that rule. Regardless, protection is limited to those areas that are considered as inventoried roadless areas; no inventoried roadless areas exist in the planning area. The Calf-Copeland inventoried roadless area lies to the southeast of the Baked Apple planning area; the Cougar Bluffs inventoried roadless area lies to the west; and the Limpy Rock inventoried roadless area lies to the North, just across the North Umpqua Wild and Scenic River. There would be no effects to inventoried roadless areas under any alternative.

The low road density areas mapped by ONRC are translated to unroaded areas, as defined by the 2000 Roadless Area Conservation FEIS. As defined in that FEIS, unroaded areas do not overlap with inventoried roadless areas. Unroaded areas can be any area, without the presence of classified roads, of a size or configuration sufficient to protect the inherent characteristics associated with its roadless condition. Classified roads are those permanent roads intended for long-term use that are tracked as part of the Forest's transportation system. The temporary roads proposed under the various Baked Apple salvage alternatives are not classified road; they are not intended for long-term vehicle transportation and they will not remain open or drivable after the timber sale is completed.

⁶¹ Uninventoried roadless areas are areas of land that were not identified during the development of the Umpqua National Forest Land and Resource Management Plan and are not displayed in Appendix C of the LRMP.

Limpy Creek

Affected Environment

The Limpy Creek area is a steep, dissected canyon with limited access for humans. A series of waterfalls block upstream passage for fish and make foot travel difficult for people as well. No developed trails are located within the headwaters of Limpy Creek. The file provide by ONRC encompasses the headwaters of Limpy Creek, and becomes irregularly shaped as it moves into Bachelor and Fairy Creeks. In some locations, roads surround the area or are located less than one-third of a mile apart. Throughout the area, evidence of human management is highly visible. Field reconnaissance showed that while standing in proposed harvest units 79A (mid slope), 68, 48B and 48A, one could hear traffic either on Highway 138 or on the adjacent forest roads. Even with all of the dead trees standing, the lack of ground vegetation and needles on the trees allow for high visibility throughout the stand and across the landscape. The exception to this is at the bottom of Limpy Creek. Field reconnaissance into the creek bottom from unit 79A documented a sense of solitude, with few human sounds evident. This area is fairly secluded, was moderately to intensely burned by the fire, and is very difficult to access on foot.

Environmental Effects

The no action alternative and Alternative 5 retain all trees and construct no temporary roads; there would be no direct impacts to this low road density area as a result of these alternatives. However, indirect impacts would occur to the scenic quality of the area. Only existing plantations would be regenerated under Alternative 1, while only 220 acres would be regenerated under Alternative 5. Shrub fields would dominate the burned landscape in areas that are not reforested. Another high intensity fire would likely occur as fuels accumulate. Another fire would consume snags that were left and would again return the area to an early-successional forest. Cumulatively, across the landscape, the scenic quality of the area would be impacted for decades.

The action alternatives proposed to harvest and construct temporary roads within this area to various degrees as displayed in Table 6 in Chapter 2. Alternative 4 would harvest the most acres; this alternative would have the most potential to directly affect the environment, both in terms of habitat (discussed in the Wildlife section of this chapter) and solitude of this low road density area. Human activities would be apparent following harvest, as stumps and logging corridors would be visible in the short-term, but would be undetectable as the area was reforested. Retention of snags and aggressive reforestation of the harvest units would help return the area to a forested condition, improving the scenic quality of the area. Once the proposed activities were concluded, the area nearest the creek bottom would continue to provide solitude, as riparian reserves would help buffer the effects of the salvage activities. Areas mid slope or nearest the roads would be visibly altered. In terms of greatest to least impacts of the human environment from salvage activities, Alternative 4 is followed by Alternative 2, 6, then 3. However, the beneficial effects of reforesting the area to restore the scenic quality help mitigate the effects of the salvage. Overall, there would be a low to very low potential of impacting the character of the area with the proposed activities.

Alternatives 4 and 6 each proposed construction of 0.94 miles of temporary road, while Alternatives 2 and 3 proposed construction of 0.66 miles of temporary road within this area. Most of the proposed temporary road construction/reconstruction occurs on unit

75, where evidence of the old spur roads is highly visible. There would be a short-term direct effect of construction or reconstruction of these roads; however, the temporary roads would be restored and reforested following harvest, minimizing the direct effect of road activities in the long-term. No other indirect, or cumulative impacts are predicted to occur.

Horseshoe Bend

Affected Environment

The Horseshoe Bend area is located primarily to the east of the planning area; a road separates it from the Calf-Copeland inventoried roadless. ONRC maps the area as occurring south of the Horseshoe Bend Campground, west along the North Umpqua Wild and Scenic River corridor, and south up Panther Creek to the confluence of Limpy Creek. No developed trails are located within this area of Calf Creek. In the area near Panther and Limpy Creek, roads surround the area or are located less than ½ mile apart. Evidence of human management is highly visible in this area. Along the North Umpqua Wild and Scenic River, the sounds of the highway and the view of the powerline are obvious. Field reconnaissance in units 59A and near the confluence of Panther and Limpy Creek resulted in detection of traffic noises that came from Highway 138. The dead trees do not block the view of the surrounding roads and past management activities. Within the Calf Creek area, however, solitude is more easily found, although access to this area is also difficult. Several harvest units totaling about 70 acres from the 1987 Apple Fire Salvage are located in the middle of the area mapped by ONRC. These areas were helicopter logged and are more open; stumps are visible.

Environmental Effects

The no action alternative and Alternative 5 retain all trees and construct no temporary roads; the indirect and cumulative impacts of these alternatives would be the same as described for Limpy Creek.

The action alternatives would harvest and construct temporary roads within this area in minor amounts as displayed in Table 6 in Chapter 2. No harvest would occur in the Calf Creek area or within the Wild and Scenic River Corridor; the potential harvest units that would affect this area are located along the 4720 road. Alternative 4 would harvest the most acres (55); this alternative would have the most potential to directly affect the environment, as discussed for Limpy Creek. The effects would be the same as those described for Limpy Creek, but to a much lesser degree, as fewer acres would be harvested. Alternatives 2, 3, and 6 would each harvest 43 acres and would have similar direct effects as Alternative 4. The impact to the character of this area would be negligible. Cumulatively, when combining the effects of this and the salvage in Limpy Creek, the impact to the character of the area would remain low.

Alternative 4 proposes construction of 0.15 miles of temporary road, while Alternatives 2 and 3 proposed construction of 0.02 and 0.02 miles respectively; Alternative 6 no longer proposed road construction into the mapped low road density area. The temporary road construction associated with Alternatives 2, 3, and 4 would occur on unit 59A, along a flat ridge at the top of the harvest unit. This temporary road would be restored and reforested following harvest, minimizing the direct effect of spur road activities. No other indirect or cumulative impacts are predicted to occur.

OPTIONS FOR WILDERNESS, INVENTORIED ROADLESS, OR ROADLESS DESIGNATION

During the 45-day comment period, the John Muir Project requested an analysis of the impacts of the proposed logging on uninventoried roadless areas (unroaded areas) with respect to wilderness designation eligibility. That group expressed the belief that the areas would no longer be eligible for such designation once the proposed logging occurs. The Wilderness Act of 1964 defined wilderness as an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements of human habitation and that a) generally appear to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticed; b) has outstanding opportunities for solitude or a primitive or unconfined type of recreation; c) has at least 5,000 acres of land or is of sufficient size as to make it practicable its preservation and use in an unimpaired condition; and d) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Neither the Limpy or the Horseshoe low density road areas readily lend themselves to the future option of wilderness designation given their small size (1,300 and 1,680 acres, respectively), their narrow configurations, the presence of substantial amounts of visible human management in most of their areas, and sound intrusions from Highway 138. In addition, those same characteristics also detract from future designation as Roadless or Inventoried Roadless Areas. The surrounding classified roads are permanent roads in the matrix land allocation where timber harvest and silvicultural activities will continue to dominate.

Alternatives 1 and 5 would not foreclose the future option of either Limpy or Horseshoe being designated as wilderness, roadless, or inventoried roadless, however low that option may be. Neither Alternatives 1 nor 5 take any action within the two areas. None of the action alternative construct any permanent road in the Limpy or Horseshoe low density road areas. Alternatives 2, 3, 4, and 6 would lessen the likelihood of wilderness, roadless, or inventoried roadless eligibility in the short-term given the visual dominance of stumps over the next 20 years. Yet, over the long-term, as vegetative succession proceeds, the open post-fire character will gradually change to an even-aged forest stand, masking the visual dominance of the salvage activities. However, the impact to future eligibility as wilderness, roadless, or inventoried roadless is considered extremely low under Alternatives 2, 3, 4, and 6 because the criteria for meeting wilderness, roadless, or inventoried roadless areas, regardless of the effects of the alternatives, are lacking.

AIR QUALITY

Affected Environment

Air quality can be severely impacted by the presence of particulate matter and other pollutants during large wildfire events. Impacts from the Apple Fire were seen at Crater Lake National Park 20-25 miles to the southeast, Diamond Peak/Mt. Thielsen 30-35 miles to the northeast, Roseburg 30-35 miles to the west and Oakridge 30-35 miles to the northeast. The 2002 Apple Fire, along with the Tiller Fires, created inversions and smoky conditions that prohibited visitors to Crater Lake from viewing lake vistas. Impacts to

residents, visitors, and fire personnel in Douglas County also occurred, as some residents and firefighters suffered from respiratory illnesses as a result of the inversions. Prevailing winds in the area tend to be up canyon (blowing to the east) during the day and down canyon at night (blowing to the west).

Activities that can affect air quality in the project area include burning on National Forest lands for hazard reduction and future wildfire occurrence and prescribed burning. The following nearby airsheds would be at risk of being impacted by the proposed fuels reduction activities:

Class I Airshed

- Crater Lake National Park 20-25 miles to the southeast
- Diamond Peak 30-35 miles to the northeast
- Mt. Thielsen 30-35 miles to the east

Designated Areas

- Roseburg 30-35 miles to the west

Special Protection Zone

- Oakridge 30-35 miles to the northeast

Air Quality and Emissions

As of July 1997, the Environmental Protection Agency (EPA) revised the particulate matter⁶² standards for emissions given off during burning activities. EPA now requires PM-2.5 (particulate matter 2.5 micrometers⁶³) standards to be met. PM-2.5, or fine particles, are found in emissions given off during fuel combustion (from vehicles), and from burning of wood. PM-10, or coarse particles, are emitted from vehicles traveling on dirt roads, windblown dust, and from incomplete combustion of fuels. While PM-10 will still be monitored and regulated, PM-2.5 and smaller will also be included. This change was brought about after scientific study found a link between PM-2.5 and public health problems, which include respiratory illnesses such as asthma. The constraints this may place on forest burning are unknown. Carbon monoxide⁶⁴ (CO) is also identified an emission that can cause adverse health effects. The Forest Service will achieve strict compliance to all aspects of the Clean Air Act by working in conjunction with the Oregon Department of Forestry to follow the Oregon Smoke Management Plan. A 'permit' will be acquired by providing a unit description and planning all burning with the Oregon Department of Forestry. Any planned variances from the daily burning instructions will be discussed and approved by the Smoke Management Duty Forecaster.

Prescribed burning can affect air quality in ways similar to wildfires; however, prescribed burning offers many advantages over wildfire. The effects of prescribed fire can be manipulated to reduce adverse effects to air quality. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, diurnal wind shifts, appropriate ignition techniques and rapid mop-up. This can lead to a decrease in possible effects from emissions. Table 69 displays the emissions that are produced when forest fuels are burned.

⁶² Particulate matter is the general term used for particles found in the air, including dust, dirt, soot, smoke and liquid droplets. Fine particles are considered to be 2.5 micrometers in diameter or less (PM-2.5); anything larger is considered a coarse particle, such as PM-10.

⁶³ A micrometer is equivalent to one-thousandth of a millimeter.

⁶⁴ Carbon monoxide is a colorless, odorless, poisonous gas that is formed when carbon in fuels is not burned completely.

Table 69. Pounds of Emissions Produced Per Ton of Fuel Consumed

Fuel Type	TSP (Total suspended Particulate Matter)	PM10	PM2.5	CO
Broadcast or Underburned Douglas-fir/hemlock	29.6	23.1	21.8	312
Piled Fuels	28.4	19.0	17.1	169

In order to manage emissions from fuels reduction activities, fire managers evaluate the treatment methods based on level of risk, ability to meet objectives, and potential for impacts. Table 70 describes the smoke management options and impacts for management consideration.

Table 70. Smoke Management Options.

Treatment	Timing	Benefits	Impacts
No treatment	N/A	No emissions from fuels.	Highest potential for large amount of emissions during potential wildfire.
Broadcast or underburn	Spring or Fall, usually prior to the passage of a moisture-bearing frontal system.	Fire managers have a great deal of control over total particulate matter produced by burning when large fuels are still too moist to burn. Potential for wildfire in the future is reduced, decreasing potential for higher emissions that may occur in a future wildfire. Ease of future fire suppression is increased.	Produces highest amount of particulate matter of all treatment options.
Pile and burn	Fall or winter, when raining or snowing	Produces less pounds of particulate matter per tons of fuel burned. Potential for wildfire is reduced, although less than underburning. Ease of future fire suppression is increased.	Produces moderate amount of particulate matter. Can cause severe, localized impacts to soil resource.

Prescribed spring underburning would generally be accomplished from March to June. This is when the large fuel and duff moistures are high, thus reducing total particulate matter that would be produced. Mixing (the height at which smoke will lose its buoyancy and stop rising) is generally very good this time of year and inversions are usually rare. Burning would be done only during atmospheric conditions that allow good smoke dispersal.

Prescribed fall underburning would generally be accomplished during late September to late October. Coordination with the weather service would be needed to provide fire managers with most optimum days for burning within the prescription parameters and to utilize fall rains for mop-up and reduce fuels consumption overall.

Prescribed pile burning would generally be accomplished from October to December period. Mixing⁶⁵ is extremely good this time of year and inversions are usually rare. Burning would generally be accomplished during or after frontal systems that provide very favorable smoke dispersal. Pile burning produces fewer pounds of particulate, per ton of slash burned, than broadcast or underburning.

Burning would not be done during the restricted period in the Oregon Visibility Protection Plan, currently July 1 to September 15 without waivers from Salem Smoke Management Forecaster.

Environmental Effects

Direct, Indirect, and Cumulative Effects of Alternative 1 (No Action)

Under this alternative, PM-10, PM-2.5, and CO emissions would not be produced directly from burning of activity generated fuels. The potential for substantial indirect degradation of air quality from wildfire in the future, as surface fuel deposition occurs, would not be reduced. The No Action Alternative does not provide any opportunity to cumulatively reduce existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a large wildfire, air quality degradation could exceed Federal and State standards as far as 50 miles down wind. Forest fuels would continue to increase with biomass production out-producing the decomposition rates in this climate. Long-term chronic effects of wildfires include higher PM-10 and PM-2.5 emissions, mostly due to large areas of exposed soil and ash in the aftermath of a high intensity wildfire.

The project area would be subject to long-term deposition of surface fuels from snags due to the high tree mortality experienced from the Apple Fire. These snags would contribute to the fuel available for a potential wildland fire, again increasing the potential for higher emissions.

Direct, Indirect, and Cumulative Effects of all Action Alternatives

Predicted emissions from prescribed burning in the proposed area have been estimated using emission factors from Fastracs, a smoke management and reporting computer program.

Temporary and short-term visibility impacts can be expected in the immediate project area during actual ignition and would be affected by wind speed and direction. Drainage inversions would affect nighttime dispersal of smoke, with possible smoke effects occurring 5 to 10 miles down wind. Smoke from burning forest fuels can impact human health as described earlier, particularly for the ground crews at the site. The localized effects of burning in the project area would be short-term degradation of air quality from prescribed burning, primarily during the actual burning stage and during night time canyon inversions. The prescribed burning associated with all action alternatives would be conducted in accordance with Oregon Smoke Management Plan.

⁶⁵ Mixing is the height or level in the atmosphere at which the rising smoke will lose its buoyancy and stop rising. The higher the mixing height is, the better the smoke will disperse.

Smoke from prescribed burning may be visible from dispersed recreation sites. The impacts to recreationists would be limited to the day of the burn. Burning piles in the fall would have minimal impacts to the developed or dispersed recreation users; this is due to the minimal use of recreation sites during this time of year and to the favorable dispersal of smoke. Hunters in the area may be affected for a short period of time (the day of the burn), but would not experience adverse cumulative impacts.

If a wildfire event does occur after implementation of the Action Alternatives, it is expected that concentrations of all smoke related emissions would be less than in the No Action Alternative due to the reduced levels of fuel available. All prescribed burning activities are coordinated with the state air quality agencies to ensure that atmospheric stability and mixing heights are advantageous for dispersion of emissions. Therefore, although prescribed burning contributes to cumulative effects, the effects would not exceed state and local air quality standards (Table 71). There may be cumulative effects if adjacent landowners federal, state and private were burning at the same time. Adherence to the Oregon State Smoke Management Plan would alleviate these impacts. Methodology and assumptions for predicting emissions are the same as for all action alternatives.

Table 71. Acres of treatment and predicted emissions for each alternative.

TREATMENT	1	2	3	4*	5	6
Total Acres	0	1075	880	1459	435	917
Underburn Acres	0	858	519	887	0	631
Hand Pile Totals Acres	0	138	297	517	413	261
Grapple Pile Totals Acres	0	26	26	35	22	25
Number of Landing Piles	0	153	141	174	94	169
Yard Top/Limbs Acres	0	8	8	0	0	0
Fall Burn Acres	0	138	297	517	413	261
Spring Burn Acres	0	858	519	887	0	631
Total Fuels Treatment Acres	0	1022	842	1459	435	864
No Treatment Acres	0	45	30	20	0	0
Total Tons of PM 2.5	0	432	336	615	82	376
Total Tons of PM 10	0	462	362	341	91	405
Total Tons of CO	0	5861	4262	7899	806	4881
Tons of Suspended Particulate Matter (not additive)	0	610	493	897	135	546

* Includes acreage from hand pile burning in riparian reserves.

No other direct, indirect, or cumulative effects are predicted to occur to air quality as a result of this project.

UNAVOIDABLE ADVERSE IMPACTS

Implementation of an action alternative may result in potential adverse environmental effects that may not be mitigated or avoided. Field reconnaissance and interdisciplinary analysis helped eliminate or mitigate many potential impacts. All Forest Plan Standards and Guidelines, Best Management Practices, project design features, and other mitigation measures and management requirements (found in Chapter 2) also lessen potential

effects. The specific effects associated with project activities were discussed throughout this chapter.

The potential still exists for adverse impacts, even with mitigation and application of standards and guidelines and BMPs. As disclosed, limited disturbance to some wildlife species may occur; recreationists may have limited access during harvest operations, and there is potential for some localized effects to soils. These impacts vary by how long they last (duration) and how severe they are (intensity). Most of these effects are predicted to be short-term in nature (during harvest operations). No Standards and Guidelines would be violated with this project; all effects would be within acceptable parameters. In addition, some monitoring is prescribed to ensure that effects are within the limits prescribed and that mitigation measures and BMP's are successful.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the removal of oil or mined ore. Irretrievable commitments are those that are lost for a period of time; such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. Irreversible or irretrievable effects, where applicable, were described in the environmental effects by resource.

Implementing the No Action Alternative would result in an irretrievable loss of the economic value of the timber. The burned timber, as discussed previously, is predicted to rapidly decay; if it is not harvested, the commercial value of that timber would be lost.

The implementation of Alternatives 2, 3, 4, and 6 would result in the irretrievable effect of foreclosing the possible option of designating the Horseshoe Bend and Limpy Creek low road density areas as wilderness areas, inventoried roadless areas, or roadless areas. The need to assess the effects on uninventoried roadless areas was established in a 2003 court ruling (*Sierra Club v. Austin*, 2003 U.S. App. LEXIS 24294). The assessment of the effects of this project on the Horseshoe Bend and Limpy Creek low road density areas, located above in this chapter, concluded that neither low density road area readily lend themselves to wilderness or roadless designation given their small size, their narrow configurations, and the presence of substantial amounts of visible and audible human activity. Although no classified, open roads (no permanent roads) would be built, Alternatives 2, 3, 4, and 6 would still lessen the likelihood of wilderness or roadless eligibility given the visual dominance of stumps over the next 20 years. However, because these alternatives would generate funding to reforest the area, the visual dominance of the salvage activities would subside over the course of at least two decades; Alternative 5 would remain visually dominated by a blackened landscape for a much longer time, as described in the vegetative succession portion of this document.

SHORT TERM AND LONG TERM PRODUCTIVITY

NEPA requires consideration of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). It is the intent of this project to continue to manage resources so that they are available for future generations. The salvage of trees associated with this project is considered a short-term use of a renewable resource. As the harvested area would be reforested, the use of the resource is considered as renewable; no impairment to the

productivity of the land to continue growing trees is projected to occur as a result of implementing this project.

The soils section of this document describes actions that would be taken in order to help maintain long term site productivity. Mitigation and project design features that would help retain effective ground cover and restore mycorrhizal functions would help maintain the long-term productivity of the project.

SPECIFICALLY REQUIRED DISCLOSURES

PUBLIC AND WORKER SAFETY

Affected Environment

Safety, as it relates to lands managed by the Umpqua National Forest, is monitored by two different agencies for two separate groups of people. Federal Occupational Safety and Health Administration (Federal OSHA), applies to the general public as they visit and recreate on federal lands. Identifying and felling danger trees along recreational travel routes would fall under Federal OSHA. During harvest operations, some temporary road closures may occur to protect the public traveling through the area; these closures would be able to fully protect the public. No direct, indirect, or cumulative effects related to the safety of the public would occur.

Oregon Occupational Safety and Health Administration (OR-OSHA) pertains to those individuals involved in forest activities, such as the activities associated with this project. The Oregon Occupational Safety and Health Code "Oregon Administrative Rules, Chapter 437 Division 6" is the guiding document relating to safety for those individuals involved in forest activities. The purpose of the rules contained in this division is to prescribe minimum safety and health requirements for those employed in forest activities work (437-006-0007). The rules in Division 6 apply to all government agencies and private employers who engage in forest activities (437-006-0003(1)).

Environmental Effects

Direct Effects:

Alternative 1: Although no acres are proposed for timber harvesting under this alternative, all trees which are subsequently determined to be a Danger Tree⁶⁶ along system roads open for travel or within those areas planned for subsequent reforestation activities or other types of forest activities within the analysis area would be felled as part of on-going road maintenance activities. Therefore, no direct effects to public safety are likely to occur.

Alternative 2: For this alternative, any of the trees planned for retention in any proposed harvest unit, next to a landing, or that occurs along commercial use roads which are subsequently determined to be a danger tree, would be felled to provide a safe work area. The retention of approximately 6-12 dead trees per acre and all green trees within units proposed for timber harvesting utilizing loader, skyline or helicopter logging systems is not anticipated to be a safety related concern since employees involved in forest

⁶⁶ Danger Tree 437-006-0005 (13): A standing live or dead tree, including snags, with evidence of deterioration or physical damage to the root system, trunk, or stem.

activities would be able to be “in the clear⁶⁷” at all times. Those units which retain 12 dead trees per acre would expose employees involved in forest activities to more safety related concerns since the “in the clear” safe work area is less than in those units which retain 6 dead trees per acre.

Alternative 3: This alternative would have similar effects as described for danger trees and the retention of 4-16 dead trees per acres as Alternative 2. Those units which retain 15-16 dead trees per acre would expose employees involved in forest activities to more safety related concerns since the “in the clear” safe work area is smaller than in those units which retain 4-6 dead trees per acre.

Alternative 4: Under this alternative, a small percentage of the acres proposed for treatment would remove small diameter timber (12-18 inches DBH) from portions of the riparian areas along some of the streams within the analysis area. This area would have more safety related concerns during felling and bucking, as larger diameter trees would be retained. These retention trees would be sources of broken tops or limbs that may fall on workers who are conducting fuels reduction activities in the Riparian Reserves. Lookouts may need to be used to ensure safety objectives are met. All other effects to safety would be the same as those described for Alternative 2.

Alternative 5: Within the units proposed for timber harvesting under this alternative, all green trees, all dead trees over 30 inches DBH, and 50% of the remaining dead trees in all diameter classes under 30 inches would be retained. As with the other action alternatives, all danger trees would be felled. Based on the Division 6 Policy relating to “In the clear” at all times for those employees involved in forest activities, it was determined that the use of a helicopter logging system was infeasible with this level and density of retention due to the effects of the helicopter’s rotor wash, which makes retained trees sway and potentially fall over, posing a high hazard to workers on the ground. However, since no helicopter logging is proposed, there would be no effects to safety from the use of helicopters. Skyline and loader logging systems would be utilized in this alternative. Because high levels of trees would be retained, this alternative would put forest workers at the greatest risk of injury compared to the other action alternatives. However, because of the ability to fell danger trees and the use of wide corridors for yarding, these logging systems would allow for employees to be “in the clear,” which mitigates any effects to safety.

Alternative 6: The effects of this alternative would be primarily the same as those described for Alternative 3. Several harvest units would retain all green trees, all dead trees over 30 inches DBH, and 50% of the dead trees in all diameter classes under 30” DBH. This prescription is the same as the prescription described for Alternative 5. These areas would utilize skyline logging systems, which would allow employees to be “in the clear;” therefore, no effects to safety are anticipated. These areas would utilize skyline logging systems, which would allow employees to be “in the clear;” therefore, no effects to safety are anticipated.

Indirect effects to safety to forest workers who plant trees, conduct inventories, etc. would occur in the areas where trees are retained. As time passes and the retained snags

⁶⁷ In The Clear 437-006-0005 (35): A position within the work area where the probability of hazardous contact with falling trees, moving logs, root wads, chunks, material, rigging and equipment is minimized by distance from the hazards and/or use of physical barriers, such as stumps, trees, terrain or other objects providing protection.

age, the probability increases that the snags will become more instable and may fall. Mitigation can reduce this risk, by requiring lookouts or by working when winds are light. No other cumulative effects to safety are anticipated to occur with this project.

CULTURAL RESOURCES

The project area has been surveyed for cultural resources. All heritage resources have been protected by eliminating the area from harvest or by buffering the areas that may occur near proposed activities.

The Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and the Cow Creek Band of Umpqua Tribe of Indians were contacted by Debra Barner, Heritage Program Manager for the Forest during the Apple and Tiller fires of 2002. The cultural resource specialists for the various Tribes were contacted by phone regarding the burned area and potential damage to archaeological sites. Through telephone conversations by Debra Barner and the Tribal cultural preservation specialists for each tribe a tour was arranged. After a date was selected, formal invitations were sent to the Tribes. The week prior to the field trip, Ms. Connie Shultz, Preservation Specialist for the Confederated Tribes of the Grand Ronde called to inform Ms. Barner that she would be unable to attend. Mr. Tooter Ansures, Cultural Committee Chairperson and Mr. Thomas Rondeau, Cultural Committee member for the Cow Creek Band of the Umpqua Tribe of Indians were able to attend the field trip on October 15, 2002 to inspect the burned area. The cultural committee members said that they support salvage of the burned area with minimal new road construction. Robert Kentta, Cultural Specialist from the Confederated Tribes of the Siletz was also unable to attend.

The Umpqua National Forest has sent a cover letter with the quarterly copies of the SOPA to each of the Tribes. Each quarter, the cover letter highlights new projects and projects that may be of interest to the Tribes; in particular, all fire salvages were highlighted to give the tribes more information.

Under the treaties with the Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and Cow Creek Band of Umpqua Tribe of Indians, no trust resources or reserved treaty rights are given for the lands managed by the Umpqua National Forest.

On January 14, 2004, Debra Barner called Mr. Robert Kentta and Ms. Connie Shultz and left a voice mail requesting to “know whether they had received enough information on our Baked Apple EIS and our timber program in general”. If they needed information, Ms. Barner requested that they please return her telephone call. Mr. Kentta and Ms. Shultz did not return her phone call. Ms. Barner also telephoned Mr. Tooter Ansures and asked if he felt he had been given enough information on the Forest’s timber salvage effort for Baked Apple timber salvage. Mr. Ansures responded that “he did feel he was given enough information and supported the salvage logging as long as we were protecting archaeological sites”.

On January 16, 2004, Debra Barner spoke with Mrs. Sue Shaffer, Tribal Chairman for the Cow Creek Band of Umpqua Tribe of Indians during a meeting on another topic. Mrs. Shaffer said that “yes, they were given enough information” about the fire salvage.

On January 21, 2004, Ms. Barner also spoke with Mr. Tom Rondeau concerning whether he had enough information on the Baked Apple EIS and the Forest timber program. Mr. Rondeau indicated he had enough information and supported the salvage logging.

Based on interactions with the tribes and inventories of the on-the-ground locations of cultural resources, no direct, indirect, or cumulative effects would occur with implementation of any of the alternatives.

UNIQUE HABITATS

The 2002 Apple Fire burned through dry meadows and unique habitats in the planning area. All unique habitats have been buffered from proposed management activities. No direct, indirect, or cumulative effects from the proposed activities are expected to occur.

WETLANDS AND FLOODPLAINS

The timber sale planning area encompasses the potential floodplain of 17 miles of perennial streams. Floodplains are within the riparian areas of Class I, II, and III streams, and vary from only a few feet, to the entire riparian area in width. No salvage activities are planned in riparian areas, except for Alternative 4. Road 4714 would be reconstructed at two sites within the riparian area of these sites for all action alternatives. The reconstructed sites would be designed to withstand a 100-year flood event. The environmental effects of road reconstruction within the floodplain consistent with the Standards and Guidelines for the Umpqua National Forest LRMP have been evaluated and declared in the LRMP Final EIS (March 1990). Since the activities in this project follow those Standards and Guidelines, this activity will not be declared separately for this sale.

No effects of any kind would occur to wetlands and floodplains with Alternatives 2, 3, 5, and 6, as all waterbodies are protected by no harvest buffers. The partial harvest and fuels treatments associated with Alternative 4 would not significantly affect the Riparian Reserves within the project area; therefore, no direct, indirect, or cumulative effects to wetlands or floodplains are expected to occur.

PRIME FARMLANDS, RANGELANDS, FORESTLANDS OR PARKLANDS

No prime farmlands, rangelands, forestlands or parklands exist within the area; therefore, no direct, indirect or cumulative effects would occur.

POTENTIAL OR UNUSUAL EXPENDITURES OF ENERGY

The action alternatives would require expenditures of fuel for workers to access the project, use power equipment and utilize the logging systems. In addition, jet fuel use for helicopter operations would also occur; however, the project would not result in any unusual expenditure of fuel. The no action alternative would require no expenditure of fuel. No other direct, indirect, or cumulative effects are expected to occur with any of the alternatives.

CONFLICTS WITH PLANS OR POLICIES OF OTHER JURISDICTIONS

Implementation of any of the alternatives would not conflict with the plans or policies of other jurisdictions, including the Tribes. This project would not conflict with any other policies, regulations, or laws, including the Clean Water Act, Endangered Species Act, and the National Historic Preservation Act. Effects to air quality and compliance with the Clean Air Act are described in this chapter.

CONSUMERS, CIVIL RIGHTS, MINORITY GROUPS, AND WOMEN

Contracting procedures would ensure that projects made available to contractors through this project would be advertised and awarded in a manner that gives proper consideration to minority and women-owned business groups. Because of this consideration, there

would be no direct, indirect, or cumulative effects to consumers, civil rights, minority groups with implementation of any of the alternatives.

ENVIRONMENTAL JUSTICE

On February 11, 1994, President Clinton signed Executive Order 12898. This order directs Federal agencies to address environmental justice by identifying and disclosing the effects of the proposed activities on minority and low-income populations. The effects of the proposed alternatives on the economic conditions of the State and county are disclosed in the Economics section of this document.

According to statistical data for Douglas County, 6.1% of the population is made up of minorities. As displayed in the Economics section of this document, unemployment and poverty in the county is higher than the State average. Since the project occurs in the middle of the Forest, there are no definable population centers that would be directly affected by the project. The Dry Creek community, which lies about 4 air miles to the east, has a small store that could see an increase in business during logging operations. The rest of the community may potentially be affected by an increase in log truck traffic. The communities of Idleld Park and Glide, which lie about 25 miles to the west, may also see an increase in business and an increase in traffic. However, none of these increases would be comparable to the logging seen in the area in the late 1980's. No adverse effects would occur.

The salvage area is not a high recreation destination area, as described in the recreation section. However, where there is concentrated and dispersed recreation (Apple Creek Campground and Fairy Shelter, plus a few dispersed sites), the effects to those recreating in the area would be greatest. Very few minority groups or low-income groups are found in this area. Because of this, very few individuals of minority populations would likely be affected by this project. Low-income populations who may spend time camping at Apple Creek may also be impacted by during implementation when logging occurs. These groups may choose to recreate elsewhere, and would likely not be negatively impacted. However, these effects would end when logging is completed. Overall, none of the alternatives imposes any other additional hardships on minority or low-income communities; therefore, there would be no direct, indirect, or cumulative effects to environmental justice with any alternative.

This page intentionally left blank.

CHAPTER 4

LIST OF PREPARERS

INTRODUCTION

This chapter lists the Forest Service Interdisciplinary Team members that prepared or help prepare the DEIS/FEIS.

BAKED APPLE INTERDISCIPLINARY TEAM

This following people were members of the Baked Apple Interdisciplinary Team (IDT):

Rick Abbott	Diamond Lake Ranger District, Certified Silviculturist. B.S. Forest Management, Penn State University, 1978. Forest Engineering Institute, Oregon State University, Corvallis, Oregon, 1990. Five seasons USFS Presale, Fire, and Silvicultural experience. One year USFS presale experience. Three years Bureau of Indian Affairs timber sale administration experience. Ten years USFS timber sale planning experience. Four years USFS Silvicultural staff experience. Natural Resources Institute, Oregon State University, University of Washington, Washington State University, 1999-2000, Certified USFS Silviculturist, 2002.
Debbie Anderson	Umpqua National Forest, Supervisor's Office, IDT Leader. M.S. Forest Resources, Oregon State University, 1994; B.S. Forest Resources, 1991; A.S. Forest Technology, Mt. Hood Community College, 1987. Over sixteen years of Forest Service experience in fire, silviculture, and planning. Currently serving as Forest NEPA coordinator and team leader of the Forest Planning Team.
Jim Archuleta	Diamond Lake Ranger District, Soil Scientist. A.S. Natural Resources, Haskell Indian Nations University, 1997. B.S. Crop and Soil, Oregon State University, 1997. One year Natural Resources Conservation Service experience in soil and water conservation practices and structures. Eight years Forest Service experience in soils, restoration and Civil Rights - Special Emphasis Program Manager.
Joy Archuleta	North Umpqua Ranger District, District Hydrologist. A.S., Saint Thomas Aquinas University, Fishkill, NY, 1993. B.S. Biology, Systemics and Ecology Track, University of Kansas, Lawrence, Kansas, 1995. M.S. Environmental Soil Science, Oregon State University, Corvallis, Oregon 1998. Hydrologist Trainee, Umpqua National Forest, Roseburg, Oregon, 1997-1999. Currently serving as District Hydrologist, North Umpqua Ranger District.

Steve Bacigalupo	North Umpqua Ranger District, Fire and Fuels. Associates of Science Degree in Forestry, Umpqua Community College, 1981. Experience: Twenty-three years experience with the Forest Service in Fire Management. Currently serving as Assistant Fire Management Officer at North Umpqua Ranger District.
Miles Barkhurst	North Umpqua Ranger District, Civil Engineer. BSME, Environmental Geosciences minor, Oregon State University College of Engineering, 1997. Twenty-four years Forest Service experience in road reconnaissance, survey, design, construction and reconstruction, Eleven years Forest Service experience in transportation planning and watershed restoration.
Larry D. Broeker	Supervisors Office Umpqua National Forest, Geologist. BA Geology from University of Montana, 1972. 3 years experience with private enterprise in mining and engineering geology. Twenty-four years experience with U.S. Forest Service in mining, engineering, and resource geology. Currently serving as Forest Geologist.
Stuart L. Carlson	Diamond Lake Ranger District, Logging Systems/Safety. AAS Degree Forest Technology New York State Ranger School 1975. Timber Cruiser 1975-1978, International Paper Company. Contract Logger, 1978, Self Employed. Forest Service Sale Administrator 1978-1995, and 1998-Present on the Olympic, Mt Hood, Malheur, and Umpqua National Forests. Water Rights Specialist, Targhee National Forest, 1995-1998. Safety Coordinator, Umpqua National Forest, 2000 - Present. Certified Sale Administrator, 1988-Present. District Planner, Diamond Lake Ranger District, 2003 - Present.
Raymond J. Davis	Umpqua National Forest, Supervisors Office, Wildlife Biologist. B.S. Fisheries and Wildlife Sciences, New Mexico State Univ., 1991. Eleven years experience in wildlife, planning and fire. Served as District Wildlife Biologist on 2 different forests (Siuslaw and Umpqua). Currently serving as the Wildlife Biologist for the Forest Planning Team.
Clint Emerson	Diamond Lake and North Umpqua Ranger Districts, District Botanist. B.S. Botany/Plant Pathology, Oregon State University, 1997. Six years experience working as a Botanist for the Umpqua NF (1997-2004).
Barbara Fontaine	Umpqua National Forest, Supervisor's Office, Aquatic Team Facilitator and Editor. M.S. Fisheries Biology, 1988, Oregon State University. B.S. Wildlife Management, Humboldt State University, 1979. Twenty-three years of Forest Service experience in timber sale planning, fish and wildlife inventories, habitat restoration, and monitoring. Currently serving as the Fisheries Biologist for the Forest Planning Team.

Jerry Harryman	North Umpqua Ranger District, Recreation. B.S. Range Management, Oregon State University, 1974. Four years of Range Conservationist assignments with Bureau of Land Management. Three years as Range Specialist with USFS. Twenty-four years of staff experience with responsibilities in range, recreation, special uses, trails, minerals, timber sales, and land programs.
Ron McMullin	North Umpqua Ranger District. Fisheries Biologist. B.S. Limnology/Aquatic Biology, University of Wisconsin - Stevens Point, 1992. Twelve years of Forest Service experience in aquatic resources and fisheries biology. Currently serving as District Fisheries Biologist and Planning Staff, North Umpqua Ranger District.
Gene Mitchell	North Umpqua Ranger District, Cultural Resources and Logging Systems. A.S. Forest Management, Umpqua Community College, 1971. Thirty-two years of Forest Service experience in timber, silviculture, cultural resources and fire. Currently serving as presale Supervisory Forestry Technician for the Forest Implementation Team.
Steve Nelson	Diamond Lake Ranger District, Economic Analyst. BS (Forestry, minor in Business Management), Humboldt State University, 1980. Forest Engineering Institute, Oregon State University, 1985. Twenty-two years Forest Service experience in NEPA, Timber, Engineering, and Transportation Planning. Currently serving as Forest Road Maintenance Supervisor, Diamond Lake Ranger District.
Kathy Postles	North Umpqua Ranger District, EIS Editing Assistant. Over eighteen years experience in fire, fuels, silviculture and wildlife. Currently survey as District Dispatcher.

OTHER CONTRIBUTORS AND REVIEWERS

The following people also contributed to the preparation of this document or reviewed the document prior to its distribution:

Wayne Brady
Stephen Buskie
Carol Cushing
Richard Helliwell
Megan Impson
James Kaineg
Yewah Lau
Dave Lockwood
Rachel L. Miller
Don Morrison
Dana York

This page intentionally left blank.

CHAPTER 5

LIST OF PARTICIPANTS, PUBLIC INVOLVEMENT AND RESPONSE TO PUBLIC COMMENTS

INTRODUCTION

This chapter documents the public involvement process that occurred during the Baked Apple Fire Salvage Project. Lists of individuals, organizations, agencies, and tribes who participated are also documented. The 45-day public comment process is also described, along with the substantive comments received on the DEIS and the Forest Service's response to those comments.

BAKED APPLE PUBLIC INVOLVEMENT PROCESS

Scoping (a process used to surface issues) for the Baked Apple Fire Salvage began with several public forums and meetings after the fire was contained. A town hall meeting to share what the District had learned about the fire was held in Glide, Oregon on December 10th, 2002; approximately 22 people attended that meeting. A second town hall meeting was held on March 4th, 2003 in Roseburg, Oregon; twenty-nine people attended that meeting to preview a possible course of action. An additional town hall meeting was held on May 5th, 2003, also in Roseburg; twelve people attended that meeting and were able to interact with the team to discuss the proposed alternatives. Interdisciplinary team meetings to review alternatives and integrate information specialists had learned were open to the public on May 6th, 2003; five people attended that meeting. A final IDT meeting was held on June 12th, 2003, so that the public could interact with the team and discuss what specialists had found about the effects of the proposed activities on their resource; nine people attended that meeting. Seven field trips occurred where the interested and affected persons viewed the fire salvage area, learned about resource concerns, and provided their ideas of how to proceed.

Based on the potential effects of the proposed action, the District Ranger determined that an environmental impact statement was the appropriate format for disclosing potential impacts. The Notice of Intent to Prepare an Environmental Impact Statement for the Baked Apple Fire Salvage Project was published in the March 17, 2003 Federal Register (68 FR 12662). Scoping continued and the project was first listed in the April 2003 Umpqua National Forest Quarterly Schedule of Proposed Actions (SOPA).

The regulatory agencies (US Fish and Wildlife Service and NOAA Fisheries) charged with overseeing the Endangered Species Act, were consulted extensively throughout the planning process. Formal consultation with the US Fish and Wildlife Service has been finalized. Members of the interdisciplinary teams from the Ash and Acker Fire Salvages at Tiller, the Biscuit Fire Salvage on the Siskiyou National Forest, and regional office experts were also consulted.

IDT members conducted extensive literature reviews in preparing their analysis. Taxa experts from the Region were consulted; the Beschta report and McIver and Starr reports were thoroughly studied and resulted in formulation of issues, alternatives or analysis.

Seventy-five comment letters were received during scoping. The Tribes (Cow Creek Band of Umpqua Indians, Confederated Tribe of the Grand Ronde Indians, and the Confederated Tribe of the Siletz Indians) were consulted; the Cow Creek Band of Umpqua Indians indicated full support for the project. No other tribal interests responded to the proposal.

Concerns from the public ranged from not salvaging fast enough, opposition to salvage, and a request to conduct restoration activities only. Numerous letters indicated support for managing the area using the “Beschta” approach. A detailed summary of the scoping comments received is located in the Project Record and is available on request.

TRIBES THAT WERE CONSULTED FOR THE DEIS/FEIS

Cow Creek Band of Umpqua Tribe of Indians
Confederated Tribe of Grand Ronde of Indians
Confederated Tribe of Siletz Indians

LIST OF PERSONS AND AGENCIES WHO PARTICIPATED IN THE PLANNING PROCESS EITHER AT OPEN HOUSES, PUBLIC FORUMS, MEETINGS, FIELD TRIPS OR WHO WROTE LETTERS OF INPUT FOR THE DEIS/FEIS

Art Adams, Nordic Plywood
Mike Anderson
Susan Applegate
Alan Baumann
Paul Beck
Bill Blodgett, Oregon Ridge and River Excursions
Dave Burr
Stephen Canning
Rachel Connelly
Ed and Mary Cooley
Jenny Council
Paul Craig
Bruce Cronk
Paul Czemerys
Michael Davis
Richard Dean
Michelle & Jack DeAngeles
Ann Dorsey
Elsa Ruth Douglass
Francis Eatherington, Umpqua Watersheds
Bill Fisher, State Senator
Jadene Fourman
David & Lynn Frazer

Beatrice Fredrickson
Dave Germond
Jake Gibbs, Society of American Foresters
Javier Goirigolzarri, Resource Management Services
Allen and Kathryn Goodwin
Harold Grout
Chad Hanson
Rick Harbick
Robin Hartman, Umpqua Basin Watershed Council
Ken Hendrick
John Hjort
Bob Hoehne
Ken Jensen
Gerald Keck, DR Johnson Lumber
Megan Kemple
Richard & Nancy Kreger
Josh Laughlin, Cascadia Wildlands Project
Jim Leoni
Penny Lind, Umpqua Watersheds
Mike W. Letourneau, US Environmental Protection Agency
Tammy Maurer, Elk Haven RV Resort
Russ McCourdy
Dave Melo
Max Merlich
Dave Metz
David Mildrexler
Cora Lynn Miller
Toby Mills
Gerry Mires
Liz Mitchell
Dave Moneh
Bill Moore, Seneca Jones Timber Co.
Dennis Morgan
Anna Morrison
Nick and Mary Murphy
Dianne Muscarell
Richard North
Dick & Connie Norte
Don Ollivant
Diana Pare
David Parker
Everett & Gail Peterson
Terri Peterson
Mike Piehl
Jeff Plikat
Wally Plikat
Robert & Jean Pollock
Jack Price
Robert E. Ragon, Douglas Timber Operators
Edward B. Schattenkerk

Chuck Schnautz
Mary Lou Schock
Richard Schramm
Gary Schroeder, C&D Lumber
Lenny Schussel
Wayne A. Shammel, Umpqua Band of Cow Creek Tribe of Indians
Kathy Shayler
Jack Shoemaker
Leeanne Siart
Phil Simon
Karen Sjurgen
John Sowell
Charles Spooner
Bruce Standley, Bruce Standley Construction
Patrick Starnes, Umpqua Watersheds
William Stiles
Bruce Stewart, Bohemia Mine Owners Association
Meera Subramanian
Nancy Tague
Jim Talburt
Erin Tobin
P. & B. Trusty
Craig A. Tuss, US Fish and Wildlife Service, Roseburg Field Office
Paul Utz
Dan Van Slyke, Douglas County Commissioner
Stanley Vejtasa, Umpqua Valley Audubon Society
Diana Wales
Frank R. Walter
Alexander F. Wilcox
Dale M. Williams
Don Wilson
Fara Wilson
Bridget Wolf
Ron Yockim

DISTRIBUTION OF THE DRAFT AND FINAL EIS

FEDERAL AGENCIES TO WHOM COPIES OF THE DEIS/FEIS WERE SENT

Western Office of Review, Advisory Council on Historic Preservation
Deputy Director, TDP, EAD, USDA Animal & Plant Health Inspection Service
National Resource Conservation Service, Environmental Coordinator of Ecological Sciences Division
U.S. Department of Agriculture, Policy and Planning Division, Office of Civil Rights
USDA, National Agricultural Library, Head, Acquisitions and Serials Branch
National Marine Fisheries Service, Habitat Conservationists Division, Northwest Region
U.S. Army Engineers Division, North Pacific, CENPD

Director, Office of Environmental Compliance, U.S. Department of Energy
U.S. Environmental Protection Agency, Office of Environmental Review
EIS Coordinator, Environmental Protection Agency, Region 10
Northwest Mountain Region, Regional Administrator, Federal Aviation Administration
Federal Highway Administration, Western Resource Center
U.S. Department of Housing & Urban Development, HUD CPD Division Director
Director, Office of Environmental Policy and Compliance, U. S. Department of the Interior
Northwest Power Planning Council
Bureau of Land Management
USDA-Forest Service R6, Environmental Coordination

STATE AGENCIES TO WHOM COPIES OF THE DEIS/FEIS WERE SENT

Department of Fish and Wildlife, Wildlife Division
Oregon Parks and Recreation Department, Resource Management and Planning
Paul Cleary, Water Resources Department
John Lilly, Division of State Lands
Dr. Vicki McConnell, Department of Geology and Mineral Industries
Department of Environmental Quality, Salem Office
Department of Land Conservation and Development
Marty Brantley, Economic and Community Development
Tom Potiowsky, State Economist
Oregon Department of Forestry, Resources Library
Jim Brown, Governor's Natural Resource Policy Director

INDIVIDUALS TO WHOM COPIES OF THE DEIS/FEIS WERE SENT

Susan Applegate
Paul Beck
Bryan Bird
Mark Boyer
Stephen Canning
Ed Cooley
Bruce Cronk
Jack De Angeles
Bob Devlin
Ann Dorsey
Rachel Dunmore

Francis Eatherington, Umpqua Watersheds
Tyler Eaton
Dave Germond
Jake Gibbs, Society of American Foresters
Javier Goirigolzarri, Resource Management Services
Chad Hanson, John Muir Project
Rick Harbick
Robin Hartman, Umpqua Basin Watershed Council
Eric Hellenthal
Doug Heiken, ONRC
Ken Hendrick
John Hjort
Bob Hoehne
Dave Horax
James Johnston, Cascadia Wildlands Project
Gerald Keck
Megan Kemple
Richard & Nancy Kreger
Josh Laughlin, Cascadia Wildlands Project
Penny Lind, Umpqua Watersheds
Lone Rock Timber Company
Ivan Maluski
Russ McCourdy
Wendy McGowan
Christie Meacham
Dave Melo
Max Merlich, Columbia Helicopters
David Mildrexler
David R. Monett
Bill Moore, Seneca Jones Timber Co.
Dennis Morgan
Mike Mullen
Geoff Niles
Steve Niles
Don Ollivant
David Parker
Dr. David Perry
Jack Price
Bob Ragon, Douglas Timber Operators
Lenny Schussel
Wayne A. Shammel, Umpqua Band of Cow Creek Tribe of Indians
Jack Shoemaker
Karen Sjorgren
Charles Spooner
Andy Stahl, Forest Service Employees for Environmental Ethics
Bruce Standley, Bruce Standley Construction
Patrick Starnes, Umpqua Watersheds
William Stiles
Meera Subramanian
Craig A. Tuss, US Fish and Wildlife Service, Roseburg Field Office

Paul Utz
Dan Van Slyke, Douglas County Commissioner
Stanley Vejtasa, Umpqua Valley Audubon Society
Joseph Vaile, Klamath/Siskiyou Wildlands Center
Diana Wales
Frank R. Walter
Anita Ward
Gerald and Robin Wisdom
Bridget Wolf
Ron Yockim

RESPONSE TO COMMENTS

The 45-day Public Comment period for the Baked Apple Fire Salvage Draft Environmental Impact Statement (DEIS) opened on October 31, 2003 and closed on December 15, 2003. The public was asked to give comment on Alternative 4 of the EIS. Thirty-eight timely comment letters were received.

In January of 2004, two interdisciplinary team meetings that were open to the public were held to discuss the comments received on the DEIS. On January 6th, seven people attended the meeting, while on January 13th, ten people attended. At both meetings, those who attended had the chance to interact with resource specialists regarding the comments that were submitted.

Comments were received from the following persons:

1. Rachel Dunmore
2. Megan Kemple
3. Mike Mullen
4. Karen Jeanne Sjorgren
5. Robert Devlin
6. Donald Ollivant
7. David R. Monett
8. Christie Meacham
9. Ed Cooley
10. Max Merlich, Columbia Helicopters
11. Stanley Vejtasa, Umpqua Valley Audubon Society
12. Joseph Vaile, Klamath-Siskiyou Wildlands Center
13. Wendy McGowan
14. Geoff Niles

15. Jack DeAngeles
16. Christie Meacham
17. Chad Hanson, John Muir Project
18. Andy Stahl, Forest Service Employees for Environmental Ethics
19. Mark Boyer
20. Anita Ward
21. Gerald and Robin Wisdom
22. Erik Hellenthal
23. Gerald Keck, Georgia Pacific Corporation
24. Robert Ragon, Douglas Timber Operators
25. David Mildrexler
26. U.S. Environmental Protection Agency Region 10
27. Francis Eatherington, Umpqua Watersheds, Inc.
28. Javier Goirigolzarri, Resource Management Services
29. Jake Gibbs, Umpqua Chapter Society of American Foresters
30. Doug Heiken, Oregon Natural Resources Council
31. Ronald Yockim, Douglas County Board of County Commissioners
32. James Johnston, Cascadia Wildlands Project
33. Steve Niles
34. Tyler Eaton
35. Dr. David Perry, retired scientist/professor, Oregon State University
36. Preston Sleeper, United States Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance
37. Patrick Starnes, Umpqua Watersheds, Inc.
38. Dave Horax, Columbia Helicopters

All substantive comments submitted must be considered and addressed. A substantive comment is defined (CFR §215.2) as:

"Comments that are within the scope of the proposed action, are specific to the proposed action, have a direct relationship to the proposed action and include supporting reasons for the Responsible Official to consider."

Examples of substantive comments are those which:

- provide new information pertaining to the preferred alternative or an alternative in the analysis;
- identify a new issue or expand upon an existing issue;

- identify a different (alternative) way to meet the purpose and need of the project;
- provide an opinion regarding one or more alternatives, including the basis or rationale for that opinion;
- point out a specific flaw in the analysis, or;
- identify a different source of credible research, which if used in the analysis could result in different effects.

It should be noted that all comments received are valuable. Alternative preferences, values and feelings also contribute to increased understanding and were carefully read and considered. The following narrative contains the comments, grouped by subject matter and paraphrased where appropriate, followed by the Forest Service's response.

Table 72. Comments received on the DEIS, by subject of concern, and the Forest Service’s Response.

Letter Number	Subject of Concern	Comment	Forest Service Response
32	Aquatic Ecosystem	The NWFP explicitly prohibits the FS from relying on short-term mitigation fixes like placement of in-stream material for preserving long-term recruitment. NWFP S&G WR-3 instructs the FS: “Do not use mitigation or planned restoration as a substitute for preventing habitat degradation (S&Gs p C-37). Failure to address this issue and provide for recruitment of future wood violates the ACS objective # 3.	Placement of large woody material was in response to the effects of the fire and the associated increases in peak flows and channel erosion not the salvage activities (DEIS pg. 213). No timber would be removed from within one site potential tree height (within 180 ft) of any stream channel (DEIS page 254). None of the Baked Apple alternatives are expected to increase peak flows (DEIS pg. 200). None of the Baked Apple alternatives would appreciably affect recruitment of large wood material (DEIS pg. 255).
27, 30	Aquatic Ecosystem	This project is not consistent with the Aquatic Conservation Strategy of the Northwest Forest Plan. Logging on unsuitable soils adjoining Riparian Reserves is not consistent with ACS objectives 1, 3, 5, 8, and 9. Commercial logging for economic purposes in Riparian Reserves is inconsistent with ACS objectives 1, 2, 3, 4, 5, 6, 8, and 9. Salvage logging leaving as few as six trees per acre is not consistent with ACS objectives 1, 2, 5, 6, 7, 8, and 9. Hazard tree logging of green trees will increase the canopy openings within the watershed even more, increasing peak flows, which is inconsistent with ACS objective #6. The project is located in the transient snow zone and will not remove much green canopy but salvage logging it will still adversely affect peak flows. Abundant snags and logs help trap snow on the hill slope with the effect of encouraging infiltration and slowing water run-off during big storm events (p 218 citing Lancaster et al. 2001). Salvage will degrade this function and effectively increase water peak flows. The EIS analysis of peak flow does not consider this.	In response to public comments received, the District Ranger has decided to remove unsuitable soils units from consideration from salvage under Alternatives 4 and 6. The NWFP Appendices pg. B-123 describes the ability to salvage timber from the riparian areas “where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and firewood cutting if required to attain ACS objectives”. Under Alternative 4, salvaging timber from 32 acres of the outer site potential tree height area and additional fuels treatments within one site potential tree height would reduce fuels and future fire risk at the site specific scale. By reducing the fuels and the risk of intense fire in these areas, riparian indicators would be protected in the short term and advanced in the long term (DEIS pg. 177 -266). Under Alternative 6, the FEIS preferred alternative, no riparian reserves would be salvaged. All action alternatives would leave enough hard snags within harvest units to meet or exceed the minimum Forest Plan Standard and Guidelines (DEIS pg. 113, 115) and the NWFP (NWFP Appendices B-145). Application of the standards and guidelines in the Northwest Forest Plan, including those related to the

Letter Number	Subject of Concern	Comment	Forest Service Response
			Aquatic Conservation Strategy, significantly limits the potential adverse effects that may result from individual projects. Achieving the objective of the ACS can only be determined over larger scales (i.e. 5th field watershed) and over long time frames (decades or longer). The scale of this project (mostly focused in on one 7th field watershed) is not of sufficient scope or duration to preclude or achieve any of the ACS objectives. Green hazard tree removal may occur along haul routes, landing areas, helicopter service landings, and within units where they are identified as a hazard to human safety (DEIS pg. 5). The removal of green hazard trees is expected to be minimized and sporadic in nature. Green hazard trees that are felled within a designated unit will be available for harvest. Those green hazard trees outside of designated units will be felled and left in place unless the tree falls on the adjacent roadway, in which case it will be salvaged. All green hazard trees that are felled from within riparian reserves will be left in place. Salvage logging will have no effect on peak flows in the subwatershed (DEIS pg. 199, DEIS Appendices, Hydrology Rpt.). Snow is not intercepted by the burned canopy and therefore collects in greater amounts on the forest floor. Because the area is in the transitional snow zone when rains fall on the larger snow pack peak flows as a result of the fire can be expected to be greater than those that would be experienced from an area with a living canopy. Effective ground cover (EGC), that would remain following site preparation (e.g. slash burning, hand pile burning, lop and scatter) is expected to reduce soil erosion when compared to no action (DEIS Appendices, Soils Rpt. Figure 6). EGC will also help to slow overland flow and help increase infiltration of precipitation into the

Letter Number	Subject of Concern	Comment	Forest Service Response
			soil. The large wood that is referred to on pg. 218 is in reference to potential landslides and debris flows and how large wood can affect the movement of such events. All areas that were identified as being highly unstable were removed from harvest consideration (DEIS pg. 150, 151 Table 34). Wood from these sites, if a slide were to occur and deliver to a stream channel, would help to reduce the velocity of the increased flows the area streams may experience due to increased peak flows as well as potentially slow the slide itself. Large wood in streams can slow stream velocity and help to dissipate the erosive power of moderate and high flows expected as a result of the fire not the salvage of dead trees.
27, 30	Aquatic Ecosystem	The watershed analysis page 56-57 indicates that wildfire is one of the “primary recruitment mechanisms” for delivering large wood to streams and developing complex stream structure that dissipate energy, store and route gravel, create diversity of aquatic habitat types, etc. The watershed analysis also indicates that streams need 50-110 pieces of large wood per mile. The DEIS indicates that large wood is currently deficit in this watershed (especially Limpy and Bachelor Creeks) and that the lower reaches of Panther and Limpy Creeks (where threatened coho live) are simplified and scoured to bedrock due in part to lack of large wood. Salvage logging on steep slopes above streams will clearly deprive streams of much needed large wood. The watershed analysis indicates that harvest and roads are inversely related to large wood abundance. The Forest Service cannot reconcile this massive salvage project with ACSO #8.	Unstable areas would not be salvaged under any alternative and only 32 acres of the outer portions of riparian reserve would be salvaged under Alternative 4 only. This would allow for large wood to be recruited to the riparian from steep unstable slopes should a slide occur and from fire-killed riparian areas. All alternatives were developed in light of the information in the watershed analysis and designed to contribute to maintaining the objectives of the aquatic conservation strategy over the long-term. In addition, Large Woody Material was added to the lower mainstem of Limpy Creek, lower Bachelor Creek, and the tributary channels of Panther, Limpy, Fairy, and Bachelor Creeks as part of the BAER restoration effort. One hundred and twenty-five large logs were placed in approximately 3.5 miles of lower Limpy and Bachelor Creeks. In addition approximately 8 miles of tributary channels had large wood added. The ACS objectives are achieved only over a period of decades or longer. The ACS objectives do not provide additional direction constraining the short-term or long-term effects of individual projects.

Letter Number	Subject of Concern	Comment	Forest Service Response
6	Economics	Value from salvaging can be recovered for the U.S. Treasury, and more importantly, KV funding for rehabilitation of burned areas. Salvage logging will also create jobs that will benefit Douglas County and Oregon.	The economic value of salvaging is tracked as a significant issue and discussed in Chapter 3 in the DEIS (pg. 267-275).
7, 38	Economics	Get this project implemented and put people back to work. Time is of the essence. This will incur a huge loss of volume in the smaller diameter wood sought by local mills today, and the tops of the larger trees which will be unmarketable. The longer this wood sits the less likely you are to have interested bidders. The mills have figured out other sources for their supply and have long term procurement sources already under contract. They are not willing to take any chances on this degraded wood, or put up with the onerous operating restrictions, road work, slash requirements and other attendant costs of working on USFS ground anymore. There is also likely going to be preservationist protests. All this diminishes your bidder pool and a willingness to pay much for the wood.	Recovering economic value is a purpose and need for this project (DEIS, pg. 5). The DEIS recognizes that the smaller diameter trees and fire-killed timber decay rapidly (DEIS page 267).
10, 23, 38	Economics Fire/Fuels	Remove dead timber from every acre possible. Good volume is being lost by staying out of riparian areas and LSRs. Too many wildlife trees are being left. Riparian areas should be selectively logged to remove fuels and rehabilitate the areas. I encourage you to salvage log every acre you can in the matrix and any additional area in LSR. None of this wood should be wasted any more than it already has by sitting for over a year.	Alternative 4 was designed to remove as much volume as possible within existing laws, policies, and regulations. In addition, an alternative was considered that removed dead trees in all riparian areas (DEIS page 15). This alternative was eliminated from detailed study because it was not consistent with short-term objectives of the riparian reserve land allocation (DEIS page 15). The responsible official directed the team to analyze areas within the Matrix land allocation only (Project Initiation Letter, March 7, 2003). Logging in LSR land allocation is considered to be beyond the scope of this project.
11	Economics	The economic gains from logging in controversial areas such as poor soils, erosion susceptible areas, and riparian areas, that Alternative 4 proposes, could be lost by delays in implementation because of the controversy these areas bring to the action.	Thank you for your comment. The agency has selected Alternative 6 in the FEIS and has eliminated the salvage in unsuitable soils units in order to reduce controversy and reduce the impact on the area.

Letter Number	Subject of Concern	Comment	Forest Service Response
11, 27, 37	Economics	In the economic analysis, the Forest Service should calculate the value to the forest that the fire achieved in improving forest health. The Economic Report also fails to show the benefits of the underburns of the Apple fire in the project area. It costs the Forest Service thousands of dollars to do prescribed burns on areas of the forest that have experienced negative results of fire suppression. The watershed analysis for the project area details how badly these prescribed burns are needed. The Apple fire accomplished over 9,000 acres of needed prescribed underburning where the overstory was minimally affected. During scoping, our organization asked many time for this economic analysis, but the DEIS only focused on the economic benefit of extracting burned trees for the benefit of the timber industry. When we complained, we were told that the economic benefit of the underburns could be as much a \$7,500,000 within the Apple fire, and almost \$3,000,000 within the Baked Apple planning area. These economic benefits of the fire should have been disclosed at the same time as the economic benefits of extracting burned trees.	These costs are considered “sunk” (similar to NEPA) and are not included in the economic efficiency analysis. The costs and benefits of the Apple Fire itself are not attributable to this proposed action, and do not differ by alternative. However, in the FEIS, the “value” of the underburn will be documented. The DEIS did respond to the scoping comments as they were understood by the IDT. Page 9 of the DEIS recognizes the value of the underburn in terms of acres burned; economics were not calculated as the scoping letter from Umpqua Watersheds (dated April 18, 2003) did not explicitly request a full economic analysis of the underburn.
27	Economics	The DEIS failed to disclose the Forest Service used watershed restoration money from the Resource Advisory Committees Title II funds to cruise and mark this timber sale. The amount could be in excess of \$111,656.00. We asked the Forest Service to correct this oversight but were told that it could only be included in the FEIS. Unfortunately, this does not allow either Umpqua Watersheds or other members of the public the opportunity to comment in detail on this part of the Economic Analysis. With this infusion of restoration money into the project, the economic returns of more environmentally friendly logging methods (such as in alternative 5) and unit choices are more viable. This should have been revealed in the DEIS. Cruising and marking for Alternative 4 especially is not consistent with the Secure Rural Schools Act because Alternative 4 prioritizes economic return purposes and de-emphasizes the protection and restoration of unsuitable soils and other resource values. Instead, the Title II funds should be	The cost of sale preparation was included in the economic efficiency analysis and disclosed in Table 64, page 270 of the DEIS. The RAC money would have been used under all alternatives as displayed in the Economic Analysis; this money was considered as part of the cost for preparing Alternative 5 and it did not change the economic returns of any alternative. The source of the money is not germane to the analysis itself. The question of proper use of Title II funds was elevated to the Chief’s level. According to Legal Council for the Washington Office, the use of RAC money to cruise and mark timber would not meet the intent of the Act. Therefore, this money was returned to the RAC for use in other projects.

Letter Number	Subject of Concern	Comment	Forest Service Response
		used to either maintain infrastructure or enhance forest ecosystems.	
27	Economics	The Economic report doesn't account for the high volume of burnt timber from the Biscuit salvage logging, the Timber Rock fire sales, and smaller salvage sales from the Diamond Lake district and Roseburg BLM. This flood of raw logs will bring the supply side up and the demand side down, potentially reducing returns to the national treasury. The DEIS must include all these economic factors.	The effect of this increased supply was addressed in the DEIS on page 272. Though very hard to quantify due to high uncertainty, the primary effect would be a reduction of delivered log prices. The effects of variations in log prices were included in the economic analysis and discussed in Chapter 3 of the DEIS (pg. 271). As a technical note, an increase in supply does not cause a decrease in demand. To more fully explore this uncertainty, an analysis will be included as a supplement to the Economic Analysis Report that will describe the log price level for each alternative at which NPV goes to zero.
27	Economics	The Economic Report also fails to include the cost of fire suppression for the Apple fire. Mike Hupp told us it cost approximately \$18,000,000.	These costs are considered “sunk” (similar to NEPA) and are not included in the economic efficiency analysis. The costs and benefits of the Apple Fire itself are not attributable to this proposed action, and do not differ by alternative. The cost of suppression for the 2002 Apple Fire was approximately \$16,500,000.
27	Economics	The use of KV is bias toward timber sales and away from recreation and other uses of the project area. KV funding never included fixing up the North Umpqua trail in the wild and scenic section of the project area.	The North Umpqua Trail is located outside the sale are boundary. Since there are no harvest units near the trail, KV could not be legally used. The Rogue-Umpqua Resource Advisory Committee (RAC) has approved Title II monies under the Secure Rural Schools Act to finance the reconstruction of the trail burned in the 2002 fire. A separate NEPA effort is underway for trail reconstruction.
27	Economics	At our meeting with the Forest Service on December 1, we asked why the smaller trees would be left, while the larger trees sold, since smaller trees are a greater fire hazard than larger trees. Ray Davis agreed there was economic impetus for this silviculture prescription. The DEIS should have made it clear that the “economic” purpose and need was being directly applied to the Riparian Reserves at the request of the timber industry in the	Ray Davis did not agree that there was an economic reason for the silviculture prescription in the riparian reserves. Ray simply re-posed the question to the group that was at the meeting to stimulate discussion. The primary drive behind the riparian reserve prescription was in response to an issue raised during scoping (DEIS page 11) that requested the Agency to

Letter Number	Subject of Concern	Comment	Forest Service Response
		Forest Service's preferred alternative.	do more to reduce fuels along the riparian reserves.
31	Economics	The stumpage values in the Economic Efficiency analysis is not clear on whether stumpage costs were derived using the dollar values developed on recent regeneration harvests of mature timber or from sales involving thinning of less valuable trees. A review of logging costs on thinnings reveals a cost of \$250 to \$300, however, when the mature timber is harvested in regeneration prescription, the logging cost is less than \$200. It would be helpful if the economic efficiency model identified what type of sale it utilized in developing the \$275 to \$407/acre cost.	Stumpage values were derived using a residual value approach to appraisal. Delivered log prices form the starting point and were derived from Oregon Department of Forestry published values for Roseburg and Southwest Oregon. (http://www.odf.state.or.us/divisions/management/asset_management/logprices/). These values are quoted by diameter range and species. Logging costs were derived from the Helipace model and empirical appraisal methods for skyline and loader. The stand diameter and species mix of each unit were estimated from stand exam data and walk-through estimates. Average logging costs range from \$191/mbf (Alt 4 & 6) to \$241/mbf (Alt 5). The commenter-quoted costs of \$275 to \$407/acre are total costs per acre, including Forest Service prep and administration, logging, slash disposal, road work, reforestation and other KV.
30	Economics	Capturing commercial log value is a questionable purpose for this project. Conducting destructive salvage operations in order to capture commercial log value is inappropriate. This plan, like so many others in the Interior Columbia Basin, calls for the liquidation of most of the remaining old forest. Just because this burned area is in a "timber production zone" in an outdated forest plan is not a reason to salvage this area. The Forest Plan is so outdated that it is effectively invalid.	The need to recover the economic value of the burned wood before it decays is an appropriate need for action based on the land allocation designated by the Umpqua National Forest Land and Resource Management Plan (Management Area 10, timber production) and the Northwest Forest Plan (Matrix land). This area is not within the Interior Columbia Basin. The Forest Plan was amended by the 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan). Plan revision of the Umpqua National Forest Land and Resource Management Plan will begin in 2007.
30	Economics	Many mitigation and monitoring efforts included in this proposal may not get funded due to inadequate K-V funds. Please disclose this uncertainty and the consequences. For instance, water quality monitoring is dependent upon staffing and funding.	Effectiveness ratings, which rate the agencies ability to implement a particular practice were developed for each BMP action for the FEIS (the DEIS addressed the overall BMP). These ratings will be included in the FEIS – all practices received a high or moderate rating.

Letter Number	Subject of Concern	Comment	Forest Service Response
			For water quality monitoring, the data collected at Panther Creek is considered critical for Forest Plan monitoring. Funding for this site is considered a priority for the forest.
5	Endangered Species	Please clarify the rationale behind the “likely to adversely affect” determination for the action alternatives with respect to the spotted owl.	The “may affect, and likely adversely affect” determination for the spotted owl was made with respect to noise disturbance under the U.S. Fish and Wildlife Service standard operating procedures in effects determinations (DEIS, pg. 123). There is “no effect” to critical habitat due to the project area being outside designated critical habitat units (DEIS, pg. 125).
27, 30	Endangered Species	The salvage will adversely affect the Oregon Coastal coho salmon that spawn within the project area, violating the Endangered Species Act.	The determination of effects for the Baked Apple Salvage Sale Project has been determined to be May Impact Individuals, but Will Not Contribute to a Trend Toward Federal Listing for coho salmon or their habitat in the Panther Creek subwatershed (FEIS page XX). This determination is substantiated by the full Fisheries Biological Evaluation (FEIS Appendices).
27	Endangered Species	Four spotted owl activity centers, including 3 pairs, will be disturbed by most action alternatives. An assumption in the DEIS is that the burned old-growth can be sold because it is of no-use to the Northern Spotted Owl. This is untrue. The “Lakes fire” burned more than 80% of the Fenton Lake Mexican spotted owl Protected Activity Center (PAC) on the Jemez Ranger District of the Santa Fe National Forest in August 2002. But the Mexican spotted owl territory that was “completely destroyed” by fire is still occupied. The owl pair produced two fledglings in the summer of 2003. Impacts to the Northern Spotted Owl from the Baked Apple salvage logging should be fully considered. The Forest Service has not disclosed any evidence that Northern Spotted Owls will abandon burned territory.	No assumption is made in the EIS that dead trees are of no use to the northern spotted owl. In fact, pages 123-124 discuss how salvage of dead trees would indirectly affect the spotted owl through alteration in its prey habitat within and adjacent to nesting and roosting habitats. The EIS also does not make the claim that owls will abandon their territories, but it does state that one pair (#710) may shift its territory (pg. 121) to the west due to impacts from the wildfire. Unlike the northern spotted owl, the Mexican spotted owl commonly nests in rock cavities (cliff faces, etc.) as is the case for the Fenton Lake owl pair mentioned by the commenter. Based on conversations with local wildlife biologist Jo Wargo, this owl pair nested in a cliff face cavity that is protected by 1-2 green trees that seemed to have survived the fire. The adult and juvenile owls (once fledged) moved to a less intensely burned area (containing more green trees than dead) to the west of the nest site. The DEIS fully considers direct, indirect and cumulative impacts to the northern spotted owl on pages 121-125.

Letter Number	Subject of Concern	Comment	Forest Service Response
32	Endangered Species	The Forest Service is assuming that all habitat for owls in the burn area has been eliminated. Even heavily burned areas provide forage and roosting habitat for spotted owls. The recommendations of the April 1992 “Spotted Owl Recovery Plan – Draft” are not being met under the proposed action, and jeopardize local populations of owls.	The DEIS defines owl habitat as “nesting, roosting and foraging habitat (NRF)” and dispersal habitat (pg. 121). It describes the fire’s impact to these habitat types on the same page and refers the reader to the Wildfire Effects Evaluation Project (USDA 2003), which was incorporated by the DEIS on page 1. The Forest Service does not assume that all habitat for owls in the burn area has been eliminated; it only states that the fire decreased amounts of these habitat types, but that lower levels remain within the planning area (pg. 121). The DEIS discusses how salvaging will cause indirect effects to the owl (pgs. 123-124) through impacts to prey species habitat (foraging habitat). Additional discussion is provided in the final EIS that incorporates information for Franklin et al. 2000 on fire’s potential impacts to habitat fitness. Late-Successional Reserves (LSR) land allocations and management directions in the Northwest Forest Plan were intended to constitute the Forest Service and BLM contributions to the recovery of the northern spotted owl (ROD A-2). The proposed salvage totally avoids salvaging within LSRs and meets or exceeds all management directions within the ROD standards and guidelines, and therefore complies completely with the Spotted Owl Recovery Plan.
26	Endangered Species	While the action alternatives impact a small portion of the remaining NRF habitat in the planning area, analyses cited in the EIS state that pair occupancy in the area has declined since 1989 and continued loss of pairs may accelerate the rate of population decline. While the EIS proposes buffers around the NRF to reduce direct and indirect impacts from timber harvesting and associated activities, it still concludes that the proposed actions “may affect, and likely adversely affect” the Northern spotted owl. We recommend that the EIS include additional measures to limit or eliminate impacts to the Northern spotted owl, such as limiting timber harvest activities to those periods of time when owls are	The reference to pair occupancy and population decline on page 122 of the DEIS is for the HJ Andrews Demographic Study Area (DSA) and represents a general trend across the range of the northern spotted owl. Page 121-122 of the DEIS documents the existing condition for all of the DSA’s that surround the Forest, including the Tyee DSA (that is west of the Forest), which shows that the populations of owls are stable. No buffers are proposed around existing NRF habitat. Spotted Owl Cores (100 acre reserves) were avoided during initial project design. As documented on page 122 of the DEIS, Alternative 4 would impact only 2.5% of the remaining NRF habitat within the planning area.

Letter Number	Subject of Concern	Comment	Forest Service Response
		not known to be nesting and eliminating all activities within and adjacent to NRF habitat.	Alternative 6, the FEIS preferred alternative, impacts 0.6% of the remaining NRF habitat in the planning area. The likely to adversely affect determination was made based on the standards set by the US Fish and Wildlife Service that presumes owl disturbance will occur. Restricting salvage activities to after July 15 would make it infeasible to complete the project.
30	Endangered Species	Pools are important for fish, but this habitat element is “at risk.” According to the NOAA checklist. Increased erosion and sedimentation from logging and road use will fill pools fuller and faster and they will remain full longer before being cleaned out by future storms. This is not addressed in the EIS.	Following a fire event of this magnitude increased erosion and sedimentation can be expected to occur. This natural erosion can be expected to drop off dramatically 3 to 4 years following a fire (DEIS p. 219). Retention of harvest slash (85% EGC) and recovering vegetation is expected to keep harvest related erosion to a minimum (DEIS pg. 150). Road use related sediment is not expected to be problematic. Log haul would occur when road conditions are determined to be favorable and not conducive to excessive wear and erosion (DEIS pg. 239). Pool formation in the bedrock driven systems that are typical in the Panther Creek subwatershed is driven by large woody material (LWM), sediment deposition, scour, and peak flows. As described throughout the analysis, the effect the Baked Apple Salvage Project is expected to have on these indicators is insignificant and much less than those caused by the fire itself. In addition post fire LWM placement and BAER road rehabilitation has improved sediment storage and reduced road related sediment production.
32	Endangered Species/ other species	The DEIS assumes that there will be no impact to torrent salamanders and Pacific Shrews because there will be no logging in riparian reserves (DEIS p. 30), but the preferred alternative would log in riparian reserves.	The DEIS clearly states that the salvage “may impact individuals or habitat but are not likely to contribute to a trend toward federal listing or loss of viability of the species” (pgs. 130 and 136, respectively). These impacts are also summarized in Table 31 (pg. 147). The DEIS states that “application of Riparian Reserve buffers would prevent or minimize timber harvesting effects”, but does not assume that there will be no impacts to the species.

Letter Number	Subject of Concern	Comment	Forest Service Response
			Alternative 6, the FEIS preferred alternative, does not propose salvage within the riparian reserve.
17	Endangered Species/ other species	The black-backed woodpeckers, which are dependent on post-fire stand-replacement forests with larger trees In nesting habitat, is declining and is “vulnerable to local and regional extinction” due to post-fire salvage logging (Dixon & Saab 2000). We, however, cannot find any analysis of the adverse impacts to this imperiled MIS species in the DEIS. This is in violation of NEPA. In addition, the DEIS fails to provide evidence that either population data or comprehensive habitat data have been gathered for this species, as required by 36 CFR 219.9. In absence of such evidence, we must assume that such evidence and data does not exist.	This species is not commonly addressed for western Cascade forests in Oregon. It is not listed as a MIS species in the LRMP. However, observations of this species during field reconnaissance warranted its inclusion in the analysis. This species is discussed on page 112 of the DEIS and listed in Table 28. The DEIS displays how standards and guidelines for this species are being met or exceeded.
17	Endangered Species/ other species	On pg. 142 of the DEIS, the Forest Service misrepresents the science on the olive-sided flycatcher very badly. The agency states that this species has been shown to “respond positively” to clearcutting, citing Altman & Sallabanks (2000). What the study actually says is that clearcutting in GREEN forest (not severely burned forest) attracts olive-sided flycatchers initially because it superficially resembles some of the openness of burned forest, but that olive-sided flycatchers appear not to be able to maintain viable populations there (i.e., it’s an ecological trap). The study recommends against post-fire salvage logging, particularly in the severely burned stands that this declining species prefers. The agency also misrepresents this study by claiming that it recommends removing all snags as not to create “ecological traps.” Nothing in the study says this. The comment about ecological traps is limited to logging in green forest, and the study recommends retention, not removal, of severely burned stands. The Forest Service must correct the inaccuracy in the FEIS and acknowledge the harm that the project will cause to the olive-sided flycatchers.	The quote is not complete. Page 142 of the DEIS states, “...respond positively to clearcut harvesting <u>as long as some singing and perching structures are retained</u> ”. The DEIS clearly states that the flycatcher’s presence in early-successional habitat appears to be dependent on the availability of snags. It also states that the species may be dependent upon stand-replacing forest fires. Altman and Sallabanks (2000) do not recommend against post-fire salvage logging. They state on page 20 of their management recommendations, “Preliminary indications of the importance of post-fire habitat to nest success indicate a need to avoid <u>or minimize</u> salvage of burned trees in forest burns.” Nowhere in the DEIS does it claim nor suggest that removal of all snags is recommended. The DEIS clearly discloses how much post-fire habitat will remain unaltered and available for this species (pg. 105, 142-143) and discloses results of landbird monitoring for this species within the planning area, that indicates a positive trend in abundance.
28	Fire/Fuels	The limited treatment area in the large impacted watershed will do little to significantly reduce the treat of repeated future catastrophic fires.	Direction was given to focus on the severely burned portion of the fire (DEIS project record, Project Initiation Letter, March 7, 2003). Other areas where omitted to avoid survey and manage requirements. Efforts where made within the planning area to reduce the hazard of

Letter Number	Subject of Concern	Comment	Forest Service Response
			future fires. After treatment, a fire within the planning area would allow effective fire suppression strategy and tactics to be deployed, giving firefighters a better chance to contain a fire before it continued into the untreated area within the watershed.
30	Fire/Fuels	The DEIS page 3 shows that plantations are at far higher risk of stand replacing fire. Page 171 indicates that old growth Douglas fir had the best survival rates. The FS should not be creating more of the dangerous plantation stands but should grow patchy type stands that are less likely to carry fire. Plant wider than 10 feet and clump trees. Leave some areas unplanted. Retain large numbers of large snags and down logs as mechanisms for creating patchiness and complexity. Large wood stores water and can resist burning under some circumstances.	Planting prescriptions vary from 10 to 40 foot spacing (DEIS Appendix D – Silviculture Prescription). Predicted seedling mortality of 30% to 50% will create patchiness. The desired stocking condition is 250-300 trees per acre at age 15-25 years to avoid the need for pre-commercial thinning. No planting is prescribed in areas where natural regeneration is expected to meet the desired stocking condition. Standing dead trees selected for leave will be the largest diameter snags available and will be left in both a dispersed and aggregated pattern. Retention levels range from 4-188 trees per acre, depending on the alternative. In particular, Alternative 6 retains between 4-15 trees per acre on most salvage units; on units where a "Beschta" type prescription is applied, between 22-175 trees per acre are retained.
6	Fire/Fuels	Overriding factor to be considered in salvaging timber is the reduction of fuel levels that could contribute to future fires that could be not only larger, but much hotter. Many of the environmental factors of common concern will, in the long-term, be protected by the removal of trees, which will create fuel breaks.	The Fire and Fuels section in Chapter 3 of the DEIS addresses the relationship between fuel levels and predicted characteristics of future wildfires (pg. 75-99). The aquatic section of the DEIS on pages 185,200, 210, 226 and 249 disclose impacts of long-term risks of residual fuels.
6	Fire/Fuels	The Dead and Down Woody Inventory of the Benchmark Sale Area in the Tiller Ranger District should be incorporated into your EIS as an indicator of future fuel loading problems associated with Alternative #5.	This data will be incorporated into the FEIS.
6	Fire/Fuels	Is there a better way to emphasize the fire frequency of the planning area? Fire frequency is a very important factor and should be a foremost issue.	Fire frequency and fire history were discussed on pages 65 and 66 of the DEIS. Additional discussion of the fire frequency of the area will be added to the Summary.
6	Fire/Fuels	The fourth sentence of the second paragraph on page 70 notes that the snag fall rates calculated do not take into account different species. Douglas-fir has a slower decay rate than many of the tree species, which may prolong the fuel loading	The data collected for the development of the model didn't look a specific species. The overall stand data including all species was collected.

Letter Number	Subject of Concern	Comment	Forest Service Response
		time span.	
7	Fire/Fuels	Late Successional Reserves (LSR) should be logged. There is a need to reduce fuel loading.	The responsible official directed the team to analyze areas within the Matrix land allocation only (Project Initiation Letter, March 7, 2003). Logging in LSR land allocation is considered to be beyond the scope of this project.
11	Fire/Fuels	Figure 29 in the DEIS shows that the preferred alternative (Alternative 4) does not reduce future fire spread as much as Alternatives 2 and 6. Since reduction of future fire risk is a key goal of the salvage logging, Alternative 4 is less successful than 2 or 6 and about the same as Alternative 3 in achieving this goal.	Figure 29 correctly displays the future fire spread. The commenter is correct in their interpretation of this graph. Future fire risk is one of the two needs of this project, with economic recovery also considered. Alternative 6, the FEIS's preferred alternative, will reduce future fire risk and still recover the economic value of the burned timber.
27, 32	Fire/Fuels	The documentation in the DEIS shows that there is no greater reduction in re-burn potential by logging alternative 4, the most extractive alternative that commercially logs unsuitable soils and riparian reserves. Table 26 on page 98 shows that future wildlife size is smaller for post-salvage using alternative 2 (622 acres) than alternative 4 (669 acres). If the purpose for alternative 4 is to reduce the possible re-burn of dead wood, it does worst than alternative 2, so this is no reason to choose alternative 4. Figure 29 also shows alternative 2 better at preventing future fires than the preferred alternative 4. Reburn models are flawed and unconvincing. The model does not indicate that the reburn will happen, it merely speculates how a fire would burn if a fire burned through the area again. Model only assumes one roadside ignition point. The difference between Alternative 4 and 5 is only 231 acres and is not worth the severe and undisclosed environmental impacts that salvage logging would have on more than a thousand acres.	The models are displaying potential effects and are for comparison. Although it is true the model predicts larger acreage of a future fire in alternative 4. Alternative 4 treats 555 more acres than alternative 2. The larger acreage is due the placement of the harvest units in proximity to other units and location within the planning area. The FARSITE model has been field tested (footnote P.81). The use of FARSITE was only used to show a comparison of effects if a reburn where to happen. It is correct that a reburn may never occur. Although fire history shows the planning area averages one fire per year and a 32% chance that on any 1000 acres within the watershed a fire will be 100-1000 acres in size. (p.65) The roadside ignition was used instead of lightning because it was more predictable than using a lightning ignition point.
27, 32	Fire/Fuels	The re-burn assumptions for alternatives 2 and 6 are exaggerated and unfounded. In various places, the Forest Service says: "We found no studies documenting a reduction in fire intensity in a stand that had previously burned and then been logged. [We] are aware of no evidence supporting the	The removal of large fuels will influence future fire severity. Large woody fuels have little influence on spread and intensity of the initiating surface fire in current fire behavior models; however, they can contribute to development of large fires and high fire

Letter Number	Subject of Concern	Comment	Forest Service Response
		contention that leaving large dead wood material significantly increases the probability of reburn.”⁶⁸ “The removal of large, merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk.”⁶⁹ The Forest Service has not disclosed this opposing scientific evidence to the public in violation of NEPA. Future reburn is in fact a good reason to leave “extra” snags and coarse woody debris, you want to leave enough material so that some is left after a potential reburn (i.e., a margin of error). The large material will have the greatest chance of surviving fire. If the Forest Service is going to assume the worse case scenario they should describe how many large logs snags and logs survived the reburn and whether those surviving trees are enough to meet forest plan requirements for snags and down logs. The Forest Service assumptions about reburn are flawed. There is absolutely no scientific evidence to suggest that a burned area like the Baked Apple fire will necessarily burn again or in the near future, that reburning will be severe or have serious environmental consequences, or perhaps most importantly, that salvage logging can prevent reburn or diminish its severity.	severity. Fire persistence, resistance-to-control, and burnout time (which affects soil heating) are significantly influenced by loading, size, and decay state of large woody fuel. (From: Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest USDA Forest Service Gen Tech. Rep. RMRS-GTR-105. 2003, James K. Brown, Elizabeth D. Reinhardt, Kylie A. Kramer). Planned snag retention meets the MOU for the Southwestern Oregon Province. Snag retention information can be found starting on page 111 of the DEIS. While it is true a fire may never start within the planning area, the fire history of the watershed (p.65) states there is on average one fire per year within the planning area. A fire that initiates outside the planning area and reaches the treated fuels of the project will exhibit diminished fire behavior and facilitate the effective and safe operations of firefighters. “Postfire logging may increase short-term fuel loads and fire risk, owing to increased fine activity fuels, but reduce intermediate and long-term fire risk through removal of larger dead structure” (Brown 1980).
27	Fire/Fuels	In all alternatives, some of the logging slash will be treated with burning. The DEIS never analyzed the impacts of this second burn, so soon after the first burn, on affected soils. And not all logging slash will be burned. This will contribute as much, if not more, to spreading a wildfire than leaving the large trees standing.	Where prescribed within the DEIS, activity created fuels will be treated to levels stated in the Umpqua Hazard Reduction Guidelines. Prompt fuels treatment would result in immediate reduction of fine fuels that have the most potential to spread a wildfire.
27, 32	Fire/Fuels	There was no evidence large (but shorter) snags will fall down in a “jackstraw” pattern, promoting a hotter fire if it were to reburn. There was a great deal of discussion at the public meetings of how the 2002 Apple fire affected the 1987 Apple Creek fire area,	Snag falldown will happen in a random fashion and not uniformly. Table 8 on p.62 shows past management practices in regards to Baked Apple. Figure 45 on p. 115 of the DEIS shows snag patches created by the

⁶⁸ Wildfire and Salvage Logging (Beschta, et al., Oregon State University, 1995). See also McIver, J. D., and L. Starr, tech eds, 2000. *Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography*. U.S. Forest Service, Pacific Northwest Research Station PNW-GTR-486. Portland, OR. Available online at <<http://www.fs.fed.us/pnw/pubs/gtr486.pdf>>

⁶⁹ Dept. of Agriculture and Interior, Report to the President (September 2000).

Letter Number	Subject of Concern	Comment	Forest Service Response
		but none of that made it into the Baked Apple DEIS. This was a large omission of facts and analysis. If included, it could have discounted the purpose for salvage logging to reduce hazardous fuels. The Forest Service should have disclosed information on the 1987 Apple Creek fire. Old trees that received an underburn in 1987 survived the 2002 fire also. Many dead trees from the 1987 fire have not fallen over, but simply melted from the top down, now standing as shorter snags. Salvage logging simply does not prevent future fires. The DEIS freely admits that the Apple Fire of 2002 is itself a reburn of the 1987 Apple Fire, which was salvage logged. “All of the clearcuts from the 1987 Apple fire within the planning area were reburned in 2002” (DEIS p. 211).	1987 Apple Fire in relation to each Baked Apple alternative. The 1987 Apple Fire was discussed throughout the document (DEIS Chapter 3 pages 62, 73, 103, 158, 200, 211, 227, 280). The conditions of the snags that remained after both the 1987 and 2002 Apple Fires was considered in the wildlife analysis. After harvest and fuels treatment and under the extreme conditions, uncontrolled wildfire will burn through treated areas. The effects of a wildfire burning through these areas will be diminished.
17	Fire/Fuels	The DEIS does not promise that slash clean-up will occur as part of the same projects. Regarding slash clean-up, 1) Have funds already been secured for post-logging slash clean-up? If so, please provide us with documentation of this. 2) How much will slash clean-up cost? Will it cost more than the revenue generated by the salvage sale? 3) How many tons per acre of slash debris will be on the ground BEFORE slash clean-up? 4) If slash is not cleaned up, either due to lack of funds or other reasons, what would be the adverse environmental impacts? In the absence of direct proof that funds have been allocated and earmarked for slash clean-up in this specific project, we have to assume that you have no actual intention of cleaning up slash after merchantable trees are removed.	The Umpqua LRMP states “Prescribed fire is a management tool that may be used to meet management and vegetation objectives and to maintain desired fuel profiles in all ecosystems”. Page 83 of the DEIS states “Treat activity-created fuels other than units designated for no treatment, to levels stated on page 84. The estimated cost of the fuels treatments are on page 270 of the DEIS. Funds will be collected from revenue generated by the timber sales to fund fuels treatments. The economic analysis demonstrates all alternatives (except 5) have a positive cost benefit ratio. After harvest but prior to fuels treatment, salvage units would represent a fuel model 12, described in the Fire/Fuels section of the appendix.
17	Fire/Fuels	The DEIS implies that the removal of large trees is necessary to prevent future severe fire. Please cite at least one scientific study that provides evidence supporting this view. We are only aware of studies which clearly state that removal of large trees is unnecessary and will not reduce future fire severity. The Forest Service must support its assertions with science or acknowledge that they are not scientifically accurate and that the DEIS does not have scientific integrity on this point.	The DEIS explains the hazard of accumulations of large fuels over time due to snag fall. The removal of large fuels will influence future fire size and severity. “Large woody fuels have little influence on spread and intensity of the initiating surface fire in current fire behavior models; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (which affects soil heating) are significantly influenced by loading, size, and decay state of large woody fuel. (Coarse Woody Debris: Managing Benefits and Fire Hazard in the

Letter Number	Subject of Concern	Comment	Forest Service Response
			Recovering Forest USDA Forest Service Gen Tech. Rep. RMRS-GTR-105. 2003, James K. Brown, Elizabeth D. Reinhardt, and Kylie A. Kramer)
19	Fire/Fuels	Leaving a large buffer on the scorched portion of Limpy Creek will leave a heavy fuel load. The fuel load and the steep slopes, aspect, and narrow canyon will add to the severity of the next fire. The heavy fuel load is the only condition we can control, so harvesting trees is required to reduce the severity of the next fire and speed up the recovery along Limpy Creek.	The Responsible Official directed the interdisciplinary team (IDT) to retain full Riparian Reserve buffers in the Project Initiation Letter (3/07/2003). An issue raised during scoping requested salvage in riparian reserves. In order to design a feasible alternative, the IDT found that limited salvage in Riparian Reserves could occur and still achieve an effects determination that would allow for timely completion of the project. In addition, an alternative was considered that salvaged throughout riparian areas, but was eliminated from detailed study (DEIS page 15).
31	Fire/Fuels	If the volume of the standing dead and dying material is not reduced there will be unacceptable fuel loads in the area for decades. With the heavy fuel loads created by both the dead and dying material as well as the regrowth of brush, the repeat fires will burn hot and create extensive long-term resource damage. While the DEIS discusses fire classes, we suggest that the DEIS address the consequences of brush growth and dead material on not only the areas proposed for harvest, but also the leave areas and surrounding forest. It is the Board of Commissioner's position that the majority of the fuel loadings must be removed during these entries to reduce the danger of repeat fires and threats to both the Baked Apple lands as well as to the adjacent lands.	The regrowth of brush depending on size and continuity will contribute to increasing spread of future fire outside and within the planning area. The growth of shrubs in the future is highly variable based on a number of factors and is difficult to predict. Shrub regrowth is discussed on page 77 of the DEIS.
31	Fire/Fuels	The DEIS should clearly discuss the risk and consequences to the environment from repeat burns if large fuel loads are left in the area. Examples of such repeat burns include the Biscuit Fire/Silver Fire and Apple Fire. In both cases, the post fire fuel loads were not reduced to acceptable levels after the fire. The history of repeat burns has demonstrated that these subsequent fires burn hotter and create resource damage that is of far greater long-term consequences than the original fire.	The fire/fuels section clearly displays the consequences of retaining high fuel loads (DEIS pages 64-100). In addition, a comparison of the alternatives based on fire and fuels parameters is found on page 98 of the DEIS.

Letter Number	Subject of Concern	Comment	Forest Service Response
30	Fire/Fuels	The Baked Apple DEIS repeatedly discredits leaving abundant snags and down wood based on a hypothetical worst case scenario of future intense fire during extreme fire weather conditions. The EIS does not explain the likelihood of the this fire, or the fact that less intense fire (wild or prescribed) could occur during less intense weather and fuel condition and dramatically alter the consequences described in the DEIS.	All snag and down wood retention meet the requirements of the Umpqua LRMP and Northwest Forest Plan ROD. As for the risk of a future fire, weather conditions used in the analysis where the same as the day of the Apple Fire ignition to display a baseline reality (above 90 th percentile, less than 10% of the year). The fire history section describes the percentage of a fire starting on any given acre within the planning area and the average number of fires in the planning area. If a future fire were to occur under less intense weather conditions, diminished fire behavior and effects would be expected.
30	Fire/Fuels	The FARSITE and BEHAVE models were run as a worst case scenario by assuming there is a fire ignition in year 25 during extreme fire weather. By assuming this fire WILL happen (instead of MIGHT happen) the Forest Service makes sure that alternatives that retain large number trees will look bad in terms of future habitat and soil erosion. The Forest Service must disclose — a. The model assumptions that underlie this worst case scenario (i.e. model parameters, assumed structure and arrangement of vegetation ingrowth of salvaged and unsalvaged area, fire suppression response, wind, explain how the models work “suppose v. 1.16” and FVS West Cascades variant 6.21, etc.) b. The fact that this fire is speculative might not happen, c. That a prescribed fire or wildfire might happen during less intense fire weather and under more moist fuel conditions and dramatically change the assumed outcomes in favor of retaining large fuels. d. The Forest Service must also disclose fire effects in other time periods. There is nothing magic about year 25. The preferred alternative will have more negative fuel/fire consequences in some time periods. e. The fact that there remains significant uncertainty over these model predictions and in fact there is a remarkable similarity in the outcomes among alternatives (Figure 29, page 83), (they are all bad) that combined with uncertainty makes the differences among alternatives almost meaningless.	The fire is a prediction and shown only for comparison. Prescribed fires would occur under much less severe conditions. Included in the fuel loading prediction tables displaying loadings at 5, 10, 15 and 25 years are predictions of fuel loadings after activity fuels are treated with prescribed fire. The outcomes are a prediction based on models and not just assumed. As stated earlier, wildfires that burn under diminished weather and fuel conditions would consume less fuel and not have the dramatic fire behavior exhibited by the 2002 Apple Fire on the day it started. Based on fire history, a fire is likely to occur once a year in the planning area; therefore, the assumption that a fire will occur is correct; the DEIS does not assume that this future fire WILL happen under the most extreme circumstances. Instead, the DEIS modeled the exact same weather conditions that existed during the 2002 Apple Fire in order to correctly model the rate at which fire can spread throughout the watershed. Fuel loadings are calculated at 25 years because the model becomes less accurate after 25 years. For accuracy, 25 years was chosen. The report shows what FARSITE predicts might happen if a fire occurs in year 25 and is not assuming a fire will happen, although the planning area averages one fire a year.

Letter Number	Subject of Concern	Comment	Forest Service Response
		f. The Forest Service is making two inappropriate assumptions: i. That future fire during the most extreme weather conditions WILL certainly happen; and ii. That less intense fire during less severe conditions of fuel moisture and weather WILL NOT happen first. Such as fire would change fuel profiles and consequences of future fires.	Model outcomes are strictly for comparison. Additional data on the models used are available in the Fire/Fuels report, Appendix D.
30	Fire/Fuels	The EIS purpose and need to reduce fuels is contradicted by several facts that are lost in the EIS: a. Page 85 says that shrub growth somewhat reduces fire indices due to fuel moisture content, and page 89 says that shrub growth will be reduced under alternative 4. b. Page 98 indicates that the preferred alternative leaves more tons/acre of fine fuels than alternative 5. c. The Forest Service must disclose that fire effects in unsalvaged areas are mitigated by some of the same factors that mitigate fire risk in salvage areas (p 83): “spacing” (unsalvaged fuel will be patchy and fall over time, not all at once), “shading from overstory” (there will be much more such shade in unsalvaged areas), “decay of fine fuels” (though there will be some pulses, tops and branches will fall over time and decay over time). All these things will “limit fire potential” in unsalvaged areas even more than salvage areas, but the EIS makes it sound like this only applies to logged areas. Correct this misinformation and redo the fuel/fire analysis accordingly. d. The EIS fire/fuels analysis does not add up. Please carefully consider all these factors and redo the analysis. e. Units that do not meet 85% effective ground cover will not have activity fuels treated. The soil benefits of this are accounted for, but the fire/fuel consequences are not disclosed.	Page 89 states that shrub growth would be less than what is expected to occur under No action, due to reforestation. It goes on to state that the effects of shrub growth and reforestation would be similar to what was described under Alternative 2. Alternative 5 harvests less volume and therefore leaves less activity generated fuels in the short term. However, fall down of snags soon accumulates and the area becomes a fuel model 12 between year 5 and 10. Unsalvaged areas will generate fuel loads similar to those described on pages 77-81. The DEIS does recognize that not all unsalvaged areas would contribute the same amounts of fuel, nor would they burn the same way in the event of a future fire. Additional discussion of the potential fuel loads is found in Appendix D, Fire/Fuels Report. Units with less than 85% effective ground cover will have low fuel loadings and broken non-contiguous fuels, lessening the hazard but possibility not meeting the hazardous fuels reduction guidelines. Because of location and proximity to other higher hazard units, activity fuels would not be treated. However after action review could determine different outcomes for these units. Page 83 of the DEIS discloses that effective ground cover would be retained as prescribed. The Fire/Fuels analysis used this information to help determine which

Letter Number	Subject of Concern	Comment	Forest Service Response
			units may not receive slash treatment. The DEIS correctly uses this information to determine future fire risk.
30	Fire/Fuels	The DEIS (page 70) says that both the FMA and BTU fuel models failed to consider the fuel and heat consequences of shrub and tree ingrowth, but such ingrowth is certainly expected and should have been considered because with ingrowth the differences between the alternatives might not be significant and the public and the decision-maker should know this.	The models don't factor in shrub growth because it is very unpredictable, as described on page 70 of the DEIS. However, the IDT did include the predicted shrub growth, which is disclosed on pages 77, 85, 88, 89, 92, and 94.
30, 32	Fire/Fuels	The Forest Service says that purpose and need is partly to reduce fuels, and the EIS claims that this project will reduce future fire hazard, but the EIS fails to disclose that logging will actually increase fuels over some time frames. If fuel loads are the issue, the Forest Service should be focusing on small material under 12 inches in diameter and they should be leaving the large diameter material that stores water and is relatively resistant to burning (in addition to providing many other important ecosystem values (Rose et al 2001)). To fully inform the public and the decision maker, the EIS must display a graph showing the fuel loads by size and by time period for each harvest unit. Salvage logging does not prevent reburn. The FS ignores the fact that replanted stands provide an ideal environment for future, high-intensity fire. In addition salvage logging operations with accumulations of large volumes of fine slash will also create conditions for a reburn. It is unlikely that fuels in an unsalvaged area would reach the same concentration as in the post-salvage scenario because decomposition breaks down much of the new material because it accumulates at a slower rate. If the forest to be salvaged will be replanted, then salvage will create new fuel loading. If it's not successfully replanted to agency standards, then the Forest Service will be violating requirements to ensure reforestation.	The DEIS does disclose that post fire salvage logging would increase short term fuel loads. Page 86 of the DEIS states "Fire behavior would also be influenced by the condition of adjacent stands and by the remaining surface fuels and snags. Currently, there are no published studies that have examined how post fire salvage logging alters the size distribution of fuels and the resulting future fire hazard. Studies on fuels left after harvesting green trees suggests that post fire logging may increase short term fuel loads and the fire risk, due to increased fine activity fuels. This short-term increase is followed by a reduced intermediate and long term fire risk through removal of larger, dead fuels (Brown 1980). After a fire, the fine fuels would remain in adjacent stands, potentially increasing the risk of future fires." Fuel loadings are displayed over time by size in representative stands. There are more units displayed in the Fire/Fuels Report, located in Appendix D. The DEIS does not state that salvage logging will prevent a reburn. The fire/fuels section explicitly states that "In general, the amount of fuel does not affect the probability of reburn or wildland fire ignitions. The meteorological and physical processes that generate lightning, and human behavior that leads to human-caused fires, determine when and where a fire ignition occurs. The real question is not whether there is a

Letter Number	Subject of Concern	Comment	Forest Service Response
			greater probability for reburn, but when reburns occur would they be of greater intensity and more destructive to natural resources” (Everett 1995). Professional experience has shown that increased fuel loads can result in increased fire intensity and severity (DEIS page 82). Page 85, 85, 88, 89, 92, and 94 discuss how the proposed reforestation levels would affect future fire behavior.
30	Fire/Fuels	The EIS also discloses that the number of pieces >9” dbh is more important than the tons per acre when considering “resistance to control” so the Forest Service should consider removing the much more abundant smaller size classes and retain the larger, less numerous, but more biologically valuable large snags and wood. This is a reasonable alternative that should have been considered.	Smaller diameter fuels will also be removed if merchantable, and will likely be knocked down during salvage operations. These smaller fuels would also be consumed during fuels treatment activities. Page 84, 87, 89, 90, and 93 all describe the average residual fuel tonnage for each alternative, which shows that smaller diameter materials will be reduced through fuels treatments. An alternative that considered fuels reduction and restoration only is described on page 15 of the DEIS.
30	Fire/Fuels	The Forest Service seems to expect perfect control of slash fires. Just enough to reduce hazardous fuels but not too much to reduce soil cover. Please disclose the uncertainty associated with both ends of this spectrum and the consequences of this uncertainty and how it compares to alternatives 3, 5, and no action.	All prescribed fire performed by the Forest Service is required to have a prescription developed (a burn plan) considering all these factors and more, before implementation of any prescribed fire project proceeds (DEIS page 51). Should a prescribed fire burn too much, mitigation in the form of seeding is prescribed. Should a prescribed fire burn too little, additional hand piling and burning may be required to bring fuels parameters to within the prescribed ranges.
30	Fire/Fuels	The NEPA document fails to disclose that NOT salvaging (e.g. natural recovery) may have some countervailing benefits in terms of fire risk and reburn potential, including: (a) large logs store water, (b) standing snags provide some shade, (c) regrowth tends to be more patchy and less dense and continuous, (d) fuels in the form of branches and dead trees fall to the ground slowly over time and have a chance to decay as they added, (e) falling snags over time tend to break up the continuity of fuels in the form of brush and reprod.	The DEIS does recognize the contribution snags and coarse wood have on the natural environment (DEIS page 52, 102-119, 147-161, 183).

Letter Number	Subject of Concern	Comment	Forest Service Response
5	Fire/Fuels	Where is the decision/standard to not salvage areas too rocky for reforestation coming from? This may cause future problems due to high predicted fuel loading.	The proposed action did not consider these areas, as initial reconnaissance focused on areas outside of unsuitable soils. However, in response to scoping, Alternatives 4 and 6 proposed salvaging in areas with unsuitable soils, primarily to reduce fuel loads (DEIS, pg. 151). However, further investigation found that in order to remain consistent with Forest Plan Standards and Guidelines regarding salvage harvest in unsuitable soil areas, these areas would not be able to be salvaged without amending the Forest Plan. This would potentially create a lengthy delay and the Responsible Official decided against salvaging on unsuitable lands. Future fuel loads were considered in the Fire/Fuels section of the DEIS.
5	Fire/Fuels	There should be some mention of barriers caused by predicted fuel loadings.	The Forest Service is not sure what type of barriers the comment is referring to. In terms of reforestation, the persons who plant the trees would find it difficult to move around some areas as fuel loads increase over time. In terms of wildlife movement, large mammals would be able to negotiate individual trees that fall; large clusters may require the mammal to move around the area. For smaller mammals, large pockets of fuels may make travel corridors safer because of the cover it provides. However, most wildlife would be able to find travel routes outside or around an area with high fuel loads.
32	Fire/Fuels	There is no substantive data that supports the role of reburn advanced by the UNF in reviews of the Beschta report, such as Everett's (1995) Review of the Beschta Report, or in other studies such as McIver and Starr (2000).	As stated previously the DEIS does not state that salvage logging will prevent a reburn. The fire/fuels section explicitly states that "the real question is not whether there is a greater probability for reburn, but when reburns occur would they be of greater intensity and more destructive to natural resources" (Everett 1995). Professional experience has shown that increased fuel loads can result in increased fire intensity and severity (DEIS page 82).
32	Fire/Fuels	The unlogged dead and dying trees from the Apple fire will soon become large downed material that provides important shade structures that obstruct solar radiation and reduce the speed and variability of surface winds, which inhibits extreme or erratic fire	All alternatives remain consistent with Forest Plan Standards and Guidelines regarding salvage harvest and tree retention. Providing fire behavior of lower intensity as only one of its objectives. Within 90 th

Letter Number	Subject of Concern	Comment	Forest Service Response
		behavior. The ability of large downed logs to store water and provide shade from the sun and wind can function to lower fire intensity and the rate of spread in the planning area. The Forest Service does not consider or disclose these possibilities.	percentile conditions fuels have retained very little moisture and contribute to higher fire hazard. The effects of shade and water retention are discussed in the aquatics section of the DEIS.
5	Fire/Fuels	The No Action alternative should talk about potential negative impacts of choosing that alternative, such as fuel loading, reforestation problems, other foregone restoration activities, and NW Forest Plan direction for matrix lands.	Discussions relating to the environmental effects of choosing the No Action Alternative can be found throughout Chapter 3 – Affected Environment and Environmental Effects of the DEIS, and in particular in the fuels section, pages 75-83.
5	Fire/Fuels Riparian Reserves	There should be some discussion of potential problems in the future caused by excessive fuel loading in riparian areas.	Discussion on fuel loads in Riparian Reserves may be found in Fire and Fuels section of Chapter 3 in the DEIS, beginning on page 89.
32	Fire/Fuels Roads	Roads are the real fire problem. The only way to reduce the chance of fire is to reduce access via roads. The project contemplated by the DEIS will increase logging (itself a vector for fire ignitions), and maintain roads that otherwise may not have supported vehicular traffic, increasing the chance of fire.	The DEIS recognizes that both meteorological and physical processes that generate lightning, and human behavior that leads to human-caused fires determines when and where fire ignition occurs. A Roads Analysis was completed for the project and is on file at the North Umpqua Ranger District. Decreasing access has the potential to decrease human-caused fires. The Responsible Official determined the level of road work that would occur with this project. No decommissioning was proposed in order to focus the project on the primary need of salvaging dead trees before the economic value was lost.
5	Fire/Fuels Reforestation	The Forest Service needs to be clear that most of the activities for reforestation and fuel treatment will depend on salvage sales.	Reforestation will be funded through Knutson-Vandenberg (KV) funds and slash treatment through brush disposal (BD) funds. The implications of funds generated by salvage sale for reforestation are evaluated in the Economics section of Chapter 3 in the DEIS (pg. 270-271). Over the past 2 years, reforestation of some burned plantations (about 1600 acres total) has been occurring using appropriated funds.
24, 28, 29	Fire/Fuels Safety	While snags are valuable for cavity nesters, retaining 6-12 trees per acre presents tremendous fire and safety hazards. Abundant material for foraging or nesting can be found within a very short distance from the harvest sites in riparian areas, in less intensely burned areas, and in nearby fires.	Planned snag retention meets the MOU for the Southwestern Oregon Province. Snag retention and Effects to Cavity nesting wildlife can be found starting on page 111 of the DEIS.

Letter Number	Subject of Concern	Comment	Forest Service Response
			Safety is addressed on DEIS pages 286-287. Retention of 6-12 TPA was not anticipated to be a safety hazard.
7, 8	Forest Health/ Insects and Disease	Move into green timber areas that were underburned to get ahead of the bug infestations. Must go beyond dead to get it.	While this project does not consider the harvest of any fire stressed or fire injured green trees (other than the few that need to be felled to facilitate logging or to provide for worker safety), the North Umpqua and Diamond Lake Ranger Districts, in cooperation with the Southwest Oregon Forest Insect and Disease Service Center will continue to monitor the actual occurrence of insect activity within the Apple fire perimeter (DEIS, pg. 168-169). Future removal of trees that die because of insect infestations is not precluded.
28	Forest Health/ Insects and Disease	Pg. 2 of the Insect section of the DEIS noted under the Current Conditions that “there is little evidence of insect activity.” However, as early as April 2003, I found most of the smaller killed trees had beetle or boring insect activity. With the huge available food source, I predict that these populations will explode over the next several years.	Permanent insect mortality plots were monitored within the Baked Apple planning area in December 2003. A summary of the most current information derived from the mortality plots has been added to the FEIS.
30, 32	Forest Health/ Insects and Disease	The DEIS needs to disclose and consider the benefits (and beneficial effects) of a healthy population of insects or a possible healthy surge in insect populations post-fire. Insects not only provide food for many species of terrestrial, aquatic, and avian species but they also help regulate forest density.	The beneficial effects of insects will be disclosed in Chapter 3 of the FEIS, under the heading “Insects” by Dr. Don Goheen, insect specialist on the IDT.
30	Green Tree Harvest	We strongly support the decision to retain all trees with any green needles. But we feel that many live trees will still be cut for safety or operational reasons and many will be damaged by logging.	Green trees would be protected through use of logical placement of skyline corridors. Felling of green trees for safety will be minimized to the extent practical, as these trees are a recognized source for seed and other benefits. It is anticipated that less than 10% of the existing green trees would be felled for safety.
32	Green Tree Harvest	The DEIS ignores the green tree logging under the preferred alternative that will increase risk of landslides in an already heavily compromised landscape.	As disclosed on page 5 of the DEIS, very few green trees would be removed. Only those felled for safety, those that occurred in logging corridors, or any green trees that could not be avoided during temporary road construction would be removed. As disclosed on pages 202-212, the risk of landslides is very small. In addition, Alternative 6, the FEIS preferred alternative,
27, 30, 32	Green Tree	How many green trees will be logged in the Hazard tree units of Alternative 4? The DEIS lacks disclosure of the impacts of	During the fire suppression activities and during Burned Area Emergency Rehabilitation work, all trees

Letter Number	Subject of Concern	Comment	Forest Service Response
	Harvest	green tree removal in these hazard tree units. Many green trees are located in hazard tree units 78B, 58A, 42, and 43. The FS admits that at least some green, unburned late-successional trees will be logged. Even the removal of fire-killed late-successional trees denies a future landscape the benefit of legacy late-successional structures, diminishes the structural complexity of recovering stands, and retards the development of future structural complexity and late-successional characteristics. We strongly support the decision to retain all trees with any green need. But we feel that many live trees will still be cut for safety or operational reasons and many will be damaged by logging. Remaining live trees are very important as current habitat (cover, shade, microclimate, nest/roost/foraging structures, etc.), as seed sources for natural recovery of locally adapted vegetation, as refugia for beneficial soil organisms, and as future sources of snags to fill the temporal gap between the batch of snags created by this fire and those to be produced in the distant future by the next stand of trees.	determined to be a hazard at that time were felled and left in place. It is unknown at this time, how many additional hazard trees exist which are currently green trees. Until a site specific evaluation is conducted prior to and during logging operations, it is unknown to any certainty exactly how many green trees will need to be felled. Danger tree or snags within reach of a work area must be evaluated to determine if it poses a hazard to personnel, Oregon OSHA rule 437-007-0225. All danger trees that can fall or slide onto a roadway must be felled, Oregon OSHA rule 437-007-0500. The majority of green trees will be left standing within the Baked Apple planning area for ecological benefit. The effects of harvesting green trees are disclosed on pages 106-108 of the DEIS. “Overall, the action alternatives impact a very small proportion (0.6% to 2.5%) of the remaining late-successional forest habitat within the planning area.
27	Green Tree Harvest	The DEIS should have explained why the Forest Service is logging in units with 60% green crown closure. This is close to natural crown closure for an old-growth forest. This doesn't meet the purpose and need of reducing unnatural high fuel loads.	Partial harvest within these stands was based on the need to recover dead merchantable timber before its value is lost to decay and deterioration within the matrix land allocation.
27	Green Tree Harvest	Why are units that are primarily located in underburn areas with many green trees being logged if they are just unburned such as 18, 58C, 59A, 44 and 25A? Unit 79A has a lot of green trees in the top of the unit, and in places, healthy, pre-fire, regeneration. Yet the prescription for here is just like the dead units, to leave six trees per acre and then replant. Likewise, Unit 75 also has live trees at the top of the unit that could be impacted by the logging. There were a number of large sugar pines still alive. At least one very large (about 4' across), live, sugar pine that is only 30' away from the road flagged for the new road into unit 75. The Forest Service should consider	Units 58C, 59A, and 44 burned at high intensity and have widely scattered green trees within them. Units 18 and 25A burned at low to moderate intensity. Harvest is based on the need to recover dead merchantable timber before its value is lost to decay and deterioration within the matrix land allocation. The majority of unit 79A and 75 burned at high intensity, therefore reforestation is necessary to achieve desired stocking levels. Existing scattered green trees within the high intensity burned areas are important as a seed source, as disclosed on page 173-174 in the DEIS. The proposed temporary spur road for unit 75 was flagged for reconnaissance purposes, and to visually

Letter Number	Subject of Concern	Comment	Forest Service Response
		routing the road round this, and other live trees. There is a large (about 3' across), live Douglas fir tree right in the middle of the orange flagging for the new road. The seed source from these trees is valuable after the fire. It is a detriment to the future forest to remove beautiful live trees and then replant with nursery stock, all without mentioning any of the impacts in the DEIS A temporary road will be built into the east part unit 79A for alternative 4 and 6, but not for other alternatives. Yet, alternatives 2, 3, 4, and 6 will skyline yard the eastern part of 79A. Why do alternatives 4 and 6 need to build a new road when alternatives 2 and 3 will do the same prescription with no new road? Areas along the new proposed road into 59A will be "loader logged". This tractor logging, along with the "temporary" new road, will have permanent effects the DEIS did not analyze.	assist the planning team in determining the location of the proposed spur so that they could, on a site-specific basis, describe the potential effects of the proposed temporary spur. New road locations will generally avoid green trees, where possible. Upon further review, the temporary road into the east part of unit 79 is not necessary in alternatives 2 and 3. The FEIS reflects this change. The DEIS describes the impacts of loader logging in unit 59A and the six other units proposed for loader logging on pages 224 and 225. The impacts of temporary road construction are disclosed on pages 225, 232 and 233 of the DEIS. There is also disclosure of the impacts of loader logging and temporary road use and reconstruction on pages 156 and 157 of the DEIS.
27	Green Tree Harvest	The DEIS should have disclosed how alive and green many of the units are. The DEIS should have considered the different impacts that salvage logging would have in green stands, as opposed to dead stands.	The effects of harvesting in green stands are disclosed on pages 106-108 of the DEIS. They state "Overall, the action alternatives impact a very small proportion (0.6% to 2.5%) of the remaining late-successional forest habitat within the planning area. Table 1 in the Silvicultural Prescription describes the general biological and physical conditions of the units, both pre-fire and post fire. If the pre-fire Oliver structural stage is the same as the post fire structural stage, the unit is still dominated by green trees. If the post fire Oliver stage is described as SI (stand initiation), the unit is dominated by dead trees.
27	Green Tree Harvest	The proposed new road into 79A and 59A will have to cut many healthy, green trees. How many more green trees will need to be removed for yarding corridors?	The potential location for the temporary road into unit 79A will cut very few, if any, green trees. The potential location of the temporary road is primarily in a stand replaced, high intensity burn area. The exact number of green trees that MAY need to be felled during yarding operations is unknown at this time because yarding corridors are determined at the time of the salvage operation, as approved by the sale

Letter Number	Subject of Concern	Comment	Forest Service Response
			administrator.
30	Green Tree Harvest	Protect all live trees. While it is true that some trees injured by fire will soon die, the agency fails to acknowledge or disclose the degree of confidence in their estimates (of trees predicted to die). An EIS is necessary to consider the effects of harvesting numerous trees that may soon die.	As described on page 5 of the DEIS, this salvage proposal will remove only dead trees, as indicated by Figure 3. The only live trees that would be felled would be those felled for safety, in logging corridors, or on temporary roads. No 'predicted to die' trees would be marked for salvage. If a proposal is formulated to harvest more trees that eventually die, another NEPA process would be initiated and the appropriate form of the documentation (CE, EA, or EIS) would be determined at that time. However, additional harvest is not considered to be reasonably foreseeable action.
5	Green Tree Harvest	Why will there be no green tree harvest outside circumstances mentioned?	The project area is focused on stand replacement burns where salvage of dead trees will help achieve the purpose and need for recovering economic value, fuels reduction, and progress toward the desired condition of a healthy, productive forest (DEIS, pg. 5).
25	Human-caused Fires	Logging companies should not be given some sort of reward for fires.	Agent Russell agreed that it would not be possible to determine whether or not the salvage was a "reward" or not. Therefore, it remains speculative as to whether or not the fire was started for monetary gain (money earned by a firefighter or money generated via salvage).
31	Human-caused fire	On pg. 13 of the DEIS, the Forest Service discusses the issue of whether salvage would reward whoever started the fire. Missing from this discussion is the recognition that no matter how the fire was started, there is still a need to restore this area as quickly as possible.	Thank you for your comment. Alternative 6, the preferred alternative for the FEIS, will remove burned trees and reforest the area in a timely manner.
6	Human-caused fires	The third sentence of the last paragraph of Chapter 1 implies that the fire was arson. The fire could have been caused, however, by accidental means.	The wording in this paragraph reflects the wording used by members of the public. This wording on page 13 of the DEIS clearly portrays the input received during scoping and therefore will remain unchanged. Ongoing investigations of the cause of the fire continue. The special investigator assigned to the fire has now determined that the cause of the fire is "suspected arson".

Letter Number	Subject of Concern	Comment	Forest Service Response
27, 32, 37	Human-caused fires	The Forest Service could be destroying valuable evidence by logging before the (arson) investigation is complete. The logging reward for this human caused fire should have been considered in this DEIS. The Baked Apple salvage sale could have been the intent of the fire. The DEIS should have considered incentives for starting fires within the scope of the analysis. Numerous citizens have expressed concern that this salvage logging project will reward past arson and encourage future arson. The Forest Service only states that since the Forest Service investigation into the cause of the fire is “on-going” that this concern is conjectural and not based on any scientific evidence (DEIS, p. 13). The Forest Service may not be concerned with this issue, but we are. There have been thousands of acres of the Umpqua National Forest burned by arsonists in the last five years. Only one of the arsonists has been arrested, and freely admitted to setting fires to realize financial benefits. The DEIS should consider how creating economic incentives for fire could cause future fire.	The Forest Service considered this issue raised during scoping as a non-significant issue as there is no evidence that the fire was started by those who have a financial interest in any resultant salvage of the burned timber (DEIS page 13). The area where the fire ignited is not proposed for salvage; any evidence that may or may not exist would not be affected by this project. Special Agent Tom Russell (Criminal Investigator attached to the USFS Law Enforcement Regional Investigative Unit), concurred that there would be no affect to the site by this proposal (personal communication, January 15, 2004). According to Special Agent Russell, investigation of the site where the fire was determined to have started has concluded. All evidence has been collected from the scene (personal communication, January 15, 2004). Special Agent Russell also concluded that this fire is “suspected arson”. This is the determination that is made if all of the common causes of fire have been ruled out. According to Special Agent Russell, unless there is something at the scene (such as physical evidence) that proves the fire was arson, the conclusion must be “suspected arson” (personal communication, January 15, 2004). The financial benefits gained by those who have started fires in the past, as indicated by letter 32, were gained during firefighting, not salvage. Special Agent Russell also concurred that it is not possible to determine the motivation of the person who started the 2002 Apple Fire (personal communication, January 15, 2004).
27	Logging/salvage	The DEIS never explained why all helicopter yarding units were removed from alternative 5 making the alternative so small it is unchoosable. Alternative 3 uses helicopters while leaving 15 trees per acre. This is close to what is left in alternative 5. The Forest Service should have considered an alternative that	This is explained on page 287 of the DEIS in relation to Alternative 5. Leave tree quantities range from 25-188 trees per acre in Alternative 5. These far exceed 15 trees per acre.

Letter Number	Subject of Concern	Comment	Forest Service Response
		includes the Beschta recommendations as well as helicopter yarding.	
26	Logging/salvage	The EIS evaluates the impacts from the natural erosion processes as well as timber harvest road impacts. However, it does not evaluate the direct impacts from timber harvest activities.	The DEIS thoroughly documents the impacts of the proposed timber harvest activities on erosional processes. Direct effects from timber salvage to the aquatic system from mass wasting are documented on pages 208-212 of the DEIS. Indirect impacts of timber harvest on fluvial erosion are documented on pages 218-219. Finally, the direct effects from salvage on surface erosion are documented in the DEIS on pages 222-228.
1, 2	Logging/salvage	Log plantations or previously logged areas, rather than old growth.	Some salvage units occur in previously harvested areas. In addition, Alternative 1, no action, does not salvage burned old growth.
3	Logging/salvage	Do not salvage log burned areas. Clearcut logging does not constitute rehabilitation.	Alternative 1, no action, does not salvage burned areas. The purpose and need stated in the DEIS is to recover dead merchantable timber, reforestation, and reduce hazardous fuels. Rehabilitation is not a stated purpose.
4	Logging/salvage	Commenter stated a preference for Alternative 5, the Beschta alternative, because no Riparian Reserves are logged, and slash is hand-piled and burned. Additionally, Alternative 5 addresses retention of functional late successional/old growth stands, retention of large snags, and protection of uninventoried roadless areas.	Thank you for your comment. Alternative 6, the preferred alternative in the FEIS, incorporates some of the retention levels found in Alternative 5, does not salvage in riparian reserves, and retains snags across the landscape.
5	Logging/salvage	There should be documentation of total estimate of burned timber in project area.	A table has been added to Chapter 1 of the FEIS addressing this. Within the 17,874 acre fire, 934 acres are proposed for salvage (5% of the entire fire area). Within the planning area, 9,808 acres burned; this project proposes salvage on about 15% of the acres burned in the planning area.
5	Logging/salvage	Total unsalvaged acres should also be included in the significant issue addressing potential salvage impacts to late successional/old growth stands.	The issue responds to the proposed action, which proposes salvage in Matrix only. Salvaging in the LSR was determined to be outside the scope of the project by the responsible official. This issue will remain as described in the DEIS. However, as stated above, additional information on the entire fire area will be added to Chapter 1.

Letter Number	Subject of Concern	Comment	Forest Service Response
6	Logging/salvage	A comparison of the number of dead/dying trees left standing in relation to the number cut would serve as an indicator of wildlife habitat, etc., remaining after any salvaging occurs.	A discussion of the parameters used in the development of the proposed action will be added to the FEIS where the proposed action is first introduced. Additionally, a comparison of all the acres of merchantable fire-killed timber resulting from the 2002 fires in the North Umpqua watershed will be displayed and compared to the acres proposed for salvage in the proposed action.
7	Logging/salvage	Use tractor logging first, skyline yarders next, and helicopters as a last resort. Build temporary roads where you need to log; they may be left for future fire suppression efforts.	Alternative 4 put more emphasis on ground-based and skyline logging systems compared to the other action alternatives (DEIS, pg. 30). Alternative 6, the preferred alternative in the FEIS, also uses ground based systems where possible, followed by skyline systems, then helicopters. All temporary roads will be rehabilitated as described in the DEIS, page 55.
9, 12, 14	Logging/salvage	Alternatives 2, 4, and 6 are completely unacceptable salvage proposals because they leave too few trees behind to help replenish the fragile, burned soils. Furthermore, Alternatives 4 and 6 log on unsuitable soils and riparian reserves.	Salvage on unsuitable soils has been eliminated from Alternatives 4 and 6 in the FEIS.
9, 12, 15, 20, 30	Logging/salvage	Alternative 5 is the best alternative. It is economically viable because the Forest Service used watershed restoration money (from the Resource Advisory Committees) to cruise and mark this timber sale. That restoration money should help restore these burned forests by leaving 50% of the dead wood in the salvage units. Alternative 3 is the next best choice.	The money originally secured to mark and cruise timber has been returned to the RAC, as the Office of General Council has determined that use of that money for timber purposes would not meet the intent of the Act, nor would the Forest be able to collect timber sale trust funds (KV and/or BD money) related to the sale.
10	Logging/salvage	The Forest Service should conduct the sales using mbf rather than ccf. With the defect at 40%+ this year, the sales will not attract bidders based on ccf. I would also strongly urge you to sell these on a scaled basis Scribner log scale as it reflects true value to a purchaser. Cubic will simply not attract bidders on salvage volume. Time is critical; these sales should have been well on the way by now. You need to offer something of value at a competitive price for bidders to show up.	The Forest received permission to offer this project utilizing MBF Scribner 20 foot maximum log measurement (Eastside Scribner) as the unit of measurement.

Letter Number	Subject of Concern	Comment	Forest Service Response
10, 24, 29, 33, 38	Logging/salvage	There will be a serious demand for logging helicopters next year for salvage and firefighting. Firefighting pays much better than logging, so there is an exodus during the summer from logging. Consider allowing salvage of Baked Apple to be done in the winter and before the Biscuit Fire salvage. The salvage sale may not get any bids if potential timber purchasers cannot be assured of the availability of logging aircraft. Our company is certainly interested in the areas that require helicopter logging. I would encourage you to get all you can by conventional means to lower the logging cost and make these more attractive to bidders. Remember that if these don't come out until summer you are right back into fire season and its restrictions and competition for helicopter services. Much of this ground is low elevation and lends itself to winter 2003/04 helicopter operations when the machines are available. With a projected volume of 25,000M requiring helicopter logging you have a large need to fill if it's next summer. Operating season is too short to do all the salvage. Availability of helicopters will be limited at that time because of wildfire suppression activities. Use winter operating season for at least a portion of the project area to help with feasibility.	The timber sale contract would allow logging during the "Normal Operation Period defined as May 1 through October 31. To extend the operating season would have required a lengthy consultation process with the regulatory agencies, further decreasing the ability to implement this project.
13, 14	Logging/salvage	Alternative 5, in leaving 50% and logging 50%, seems to be the best way to "make use" of materials as a result of the fire while simultaneously restoring the area in the best way possible.	Thank you for your comment. The Responsible Official has chose Alternative 6, as the preferred alternative for the FEIS.
16	Logging/salvage	Please proceed with the salvage. It is good for the environment/economy.	Thank you for your comment.
17	Logging/salvage	The Forest Service should retain the prescription in the FEIS and ROD to remove only "dead trees." Removal of trees with any green foliage would eliminate healthy green, old growth trees from the landscape and would have serious adverse impacts on proposed TES species such as the Northern Spotted Owl and Pacific fisher.	Thank you for your comment. Only dead trees will be salvaged. Live trees may be felled and removed, as described on page 5 of the DEIS.
17	Logging/salvage	Choose Alternative 5, with the modification to preclude the removal of snags over 15 inches in diameter. Such removal should occur through a service contract (using a portion of the	Thank you for your comment. An alternative was considered that focused on restoration and fuels reduction (DEIS page 15).

Letter Number	Subject of Concern	Comment	Forest Service Response
		funds that would otherwise be used for slash clean-up), and all slash should be treated immediately.	
20	Logging/salvage	As the Conservation member of the Rogue/ Umpqua Resource Advisory Committee, my constituency's interests are to support the most scientific and best management practices for the health restoration of the forests, wildlife, and soils while maintaining viable economic incentives for those protective goals. Therefore, the most suitable alternative is Alternative 5. This is critical because burned trees are needed, as noted in the DEIS, "for organic material to supply nutrients and moisture for soil productivity. Retention of wood aids in the revegetation of the poor sites by providing shade and possible seed germination sites." Since the burn was so severe in places and soils so rocky, extra care needs to be taken not to further compact or compromise these soils. In addition, no new roads should be constructed nor salvage trees logged on unsuitable soils and in Riparian Reserves. The Forest Service's preferred alternative, Alternative 4, seems to be too "economics" oriented serving immediate, short-term interests. Alternative 4 would eventually cause more harm than good. Alternative 6, with logging in Riparian Reserves and on unsuitable soils is unjustified as prevention against the spread of future fires. You would be destroying the very things you hope to protect.	Thank you for your comment. Alternative 6 was chosen as the preferred alternative for the FEIS. Alternative 6 does not salvage within riparian reserves. In addition, salvage on unsuitable soils units was eliminated from Alternative 6.
21	Logging/salvage	To avoid the appearance that policy and decisions are being made by the timber corporations, choose Alternative 5, which best serves clean water and the long range health and productivity of our forest, soils, fish, and wildlife.	Thank you for your comment. The effects of all alternatives are described in Chapter 3. The responsible official has chosen Alternative 6 as the preferred alternative for the FEIS.
23	Logging/salvage	Look at the entire burned area from a restoration emphasis, not arbitrarily constrained by LSR or stream buffer designations. These designations were designed for green forests, not burned forests. There exists at least an additional 2,600 acres of standing burned timber in the Apple Fire that should be salvaged and the land replanted. This will benefit the watershed, forest, and surrounding communities.	The responsible official determined that this salvage effort would occur in Matrix land in order to expedite the salvage effort. Chapter 1 of the FEIS includes information as to how the proposed action was developed.
24	Logging/salvage	Our review of the DEIS and the alternatives evaluated leads us to be critical of the limited extent of proposed restoration activities. While it is difficult to find in the EIS, we believe that nearly 4,000 acres were consumed in a stand replacement fire in this drainage, yet the most aggressive alternative evaluated	The responsible official determined that this salvage effort would occur in Matrix land in order to expedite the salvage effort. Chapter 1 will include information as to how the proposed action was developed, a table which displays acres burned both by the Apple Fire and by the

Letter Number	Subject of Concern	Comment	Forest Service Response
		was #4, which proposes reducing fuel loads on approximately 1,400 acres of dead timber. Taken out of consideration for treatment were the bulk of the riparian areas so designated under the original charter of the Northwest Forest Plan.	other fires in the 5 th field watershed. Riparian reserves are addressed below.
25	Logging/salvage	Please drop the preferred alternative (Alternative 4) because it does not take into consideration the importance of this area as wildlife habitat, the risk to the fragile soil layers, and the devastation roads will bring into this post-fire area. Alternative 4 appears contrary to protecting the fragile post-fire forest ecosystem and to maintain the natural functioning processes that will naturally recover this forest.	Thank you for your comment. The responsible official has chosen Alternative 6 as the preferred alternative for the FEIS.
25	Logging/salvage	Leave all trees over 20 inches across and at least 50% of standing dead trees. These trees are very important for wildlife and providing shade and soil stability. The large trees provide complexity in the recovering forest stand. Tree farms are not acceptable replacements for the magic complexity and interconnectedness that nature recovers with. Use the most sound science, like the Beschta Report. Refrain from building any new roads or landings.	Alternative 5 was designed to contain features described in the Beschta report. Chapter 3 recognizes the importance of large snags and down wood. No new permanent roads would be constructed with this project.
25	Logging/salvage	Do not salvage log in Late Successional or Riparian Reserves. The management plan for LSR's should be non-commercial restoration; leave them alone when no restoration is needed. Commercial logging will degrade the LSR and Riparian Reserve and prevent the Forest Service from fulfilling its duty to protect the native species. Going in after fires will significantly alter the trajectory and functioning of the post-fire ecosystem. The Northwest Forest Plan says the Reserves represent forests "in their natural conditions with natural processes, such as fire, allowed to function to the extent possible." It requires that any "salvage operations not diminish [wildlife] habitat suitability now or in the future."	None of the action alternatives propose salvage within the Late Successional Reserve. Alternative 4 proposes salvage on 32 acres of Riparian Reserve, in response to issues generated during scoping. Alternative 6 does not propose salvage in Riparian Reserves.
28	Logging/salvage	The salvage and restoration proposal falls short of the intended management for Matrix lands as prescribed by the ROD. It is disappointing to not see an alternative which considered full restoration of the Matrix lands while addressing the appropriate environmental issues like primary riparian buffers, snag retention, suitable soils, along with access, future fire risk, noxious weeds, etc.	The Forest Service believes that the preferred alternative for the FEIS, Alternative 6, balances ecological needs with the need to remove some of the burned timber before it decays.

Letter Number	Subject of Concern	Comment	Forest Service Response
31	Logging/salvage	Due to the uncertainty in the amount of dying material, the marking crews should lay out the timber sales in a manner that considers the potentially dying material in their snag calculations and group the snags rather than dispersing them across the landscape. The FEIS should clearly state that material that is green when marked but dies during the contract period may also be removed. Given that as much as 25% of the surrounding land may die as a result of insects and other stress, the desired fuel reduction and economic recovery will not be met if the dying material is left onsite. The Board recommends that footnote 3 and similar references to dead trees as being those with no visible green needles at the time of marking be removed and a marking guideline such as that used in the Easy Fire DEIS be used.	In the purpose of and need for action as described on page 5 of the DEIS, this salvage proposal will remove only dead trees. The only live trees would be felled would be for safety, in logging corridors, or on temporary roads. No 'predicted to die' trees would be marked for salvage. Dr. Don Goheen is currently conducting a mortality study collecting data from the Biscuit, Tiller and Apple fires of 2002. A rating system to predict the survival of fire damaged conifers in Southwest Oregon maybe a result of this study.
34	Logging/salvage	The west is full of tree farms. Let the old forest stay standing for prosperity. They have enough places to log, and the old growth would be made mostly into paper.	The no action alternative responds to this comment.
26	Logging/salvage	The EIS states that surface erosion will be mitigated in the harvest units by retaining and scattering harvest slash across clearcut and burned slopes to function as effective ground cover. However, the EIS does not propose any mitigation for the direct impacts from harvest activities such as skidding. The EIS needs to provide mitigation measures for the direct impacts from harvest activities along with information that demonstrates that the proposed mitigation measures are effective in reducing soil compaction, vegetation displacement, and the barring of soils, increases infiltration and thus reduces erosion.	Site-specific prescriptions for decommissioning of temporary roads have been developed and are included in the FEIS Best Management Practices and management requirements for logging practices have been prescribed (DEIS pages 48-57). BMP's are time tested practices, used for many years, that meet the objective of lessening erosion and pollution associated with land management actions.
17	Low road density areas	The adverse impacts of the proposed logging on uninventoried roadless areas with respect to wilderness designation eligibility should be analyzed. We believe that the area will no longer be eligible for such designation once the proposed logging occurs.	A discussion on uninventoried roadless areas and their potential eligibility for wilderness has been added to the FEIS.
30, 32	Low road density areas	Salvage logging in un-roaded areas is inappropriate. Further disclosure, analysis, and protection needs to be addressed that consider unimpeded operation of natural ecological processes, water quality, healthy soils; fish; and wildlife refugia, centers for dispersal, recolonization, and restoration of adjacent disturbed	Low road density areas were tracked as a significant issue (DEIS p. 11, 12, .278-280). Alternatives 1 and 5 do not enter any low road density areas. The low road density area in question is not an inventoried roadless area; no inventoried roadless areas exist in the planning

Letter Number	Subject of Concern	Comment	Forest Service Response
		sites, reference sites for research, non-motorized low-impact recreation, carbon sequestration, refugia that are relatively less at risk from noxious weeds and other invasive non-native species, and many other significant values. The preferred alternative logs in the 1,300-acre Limpy Creek roadless area.	area. There would be no effects to inventoried roadless areas under any alternative.
5	Low road density areas	Is the area mentioned by Umpqua Watersheds an inventoried roadless area or uninventoried roadless area?	The areas brought forth by Umpqua Watersheds and four other environmental groups as uninventoried roadless areas are described by the Middle North Umpqua Watershed Analysis as Low Road Density Areas (pg. 103). A description of these areas can be found on pages 278-280 in the DEIS. This project does not affect inventoried roadless areas.
27	NEPA	The Forest Service failed to properly consider a no-action alternative since hazard trees will be removed even under no action.	The No Action alternative properly addressed hazard trees. Under the no action alternative hazard trees might be felled and left in place (DEIS page 16), but they would not be sold in a timber sale. If the no action alternative was selected and the District Ranger identified a need to remove hazard trees using a timber sale, then a separate NEPA process would be initiated.
30	NEPA	The DEIS lacks any analysis or disclosure of the adequacy of BMPs in a post-fire setting.	Disclosure of the adequacy of the BMP's will be disclosed in the EIS.
30	NEPA	The Forest Service cites Starr 2000 but it's not in the references.	Mclver and Starr, 2000 are listed in the reference section on page Reference-7.
29	NEPA	While it may be beyond the ability of the Forest Service to placate all consulting agencies regarding the short-term impacts if the project was expedited, it should be stated that the long-term effects of NOT acting expeditiously are not desirable and will not achieve long-term desired results.	The effects of no action are described throughout Chapter 3.
31	NEPA	As reported in the "Biscuit Fires: Management Options for Forest Regeneration, Fire and Insect Risk Reduction and Timber Salvage" as well as Forest Fire Salvage Review (John Lowe, 2000), if the Forest Service does not respond aggressively to restore these lands, we will face a cycle of shrubs and fires for decades to come and delay in achieving the desired future condition which will affect us for generations. The failure to act in a timely manner is a decision that will have profound effects	Pages 173-176 of the DEIS document the effects of delayed regeneration on forest regrowth and succession, and includes citation of the Sessions report on the Biscuit Fire Salvage.

Letter Number	Subject of Concern	Comment	Forest Service Response
		on the local community relative to recreational use, economic value, and wildlife values.	
31	NEPA	The Forest Service is at a critical junction in making the decision whether to act or not to act. In either case, the decision has environmental consequences. We recommend that the Forest Service clearly identify the consequences of both no action and a delay in action. By treating only 1,432 acres the Forest Service is electing to delay the achievement of the desired future condition on the remaining lands (see Umpqua National Forest Land and Resource Management Plan, IV-5 to 10).	The effects of no action are described throughout Chapter 3. The preferred alternative for the FEIS, Alternative 6, represents a balance between resource protection and the need to removed burned timber before the economic value is lost.
31	NEPA	The Forest Service should examine the NEPA timeline and identify steps that can be taken to reduce delay.	Thank you for your comment. The Forest Service also has an interest in expediting this project and is working towards that goal.
35	NEPA	You've done a really nice job of pulling together information and developing alternatives. Your approach to salvaging a small proportion of the burned area and staying out of LSR's is just excellent. The commenter states that alternative 5 is his preferred alternative and maybe also the "no action" alternative.	Thank you for your comment
30	NEPA	The Forest Service should post all specialists reports in the project file on the internet. The 1990 Umpqua LRMP should also be on the internet.	All DEIS related documents, including the DEIS and the specialist reports have been posted on the Umpqua National Forest website since October of 2003. The Umpqua LRMP is now available on CD. The posting of the LRMP on the Forest's web site will be accomplished as staffing allows.
30	NEPA	The Forest Service should be sure to disclose any inconsistencies between the analysis and recommendations in the specialists reports and the DEIS. The FS has a duty to disclose and respond credible dissenting opinions.	The specialist reports have been incorporated by reference and are included in their entirety in the appendices, available in paper, CD-ROM, and on the Forest's website. The IDT had consensus as to the effects of the proposed salvage activities.
32	NEPA Fire/Fuels	The Forest Service's discussion of fire and fuels is illegal. It is illegal for the Forest Service to make bad decisions, such as the decision to aggressively salvage logged burned areas, but it is illegal to provide the public and the decision maker with bad information or fail to disclose important information. NEPA requires that agency decisions be based on the highest quality data and analysis to provide the public participation and	Discussions relating to the environmental effects of each alternative can be found throughout Chapter 3 – Affected Environment and Environmental Effects of the DEIS. Reburn risk and potential are factors of weather and human behavior and vary widely. The effects of a fire, if there was a reburn, are discussed in chapter 3.

Letter Number	Subject of Concern	Comment	Forest Service Response
		informed decision making (40 CFR 1500.1). The Forest Service has refused to disclose accurate information about the potential for reburn, the benefits of reburn, the reburn risks associated with salvage, or the potential for salvage to reduce the risk of reburn.	
32	NEPA	The DEIS makes the unsupported contention that the salvage project does not risk mass wasting or other erosion of soil movement events (DEIS p 208). The FS should disclose, as NEPA requires, the scientific consensus, underscored in the Beschta report and elsewhere that salvage logging dissected terrain risks increase peak flows, loss of soil cohesion, landslides and other forms of mass sediment delivery to streams.	Page 208 of the DEIS explicitly states that the salvage logging would not increase the AMOUT of acreage at risk for landslides, nor would the salvage logging increase the likelihood of causing mass wasting over and above what the fire is expected to cause. All areas considered to be unstable and at “maximum risk” of instability were field verified and removed from consideration of salvage (DEIS page 208). Table 53 on page 209 of the DEIS displays that a total of 6.2 acres, made up of small scattered locations, are potentially at risk or landslides. However, as the DEIS describes, these areas are potentially at risk, and may not actually ever fail.
32	NEPA	Nowhere in the DEIS does the FS state why the recommendations in the Beschta Report are not valid for the planning area. None of the reports are refuted or shown to be factually inappropriate for the proposed project. The FS has not met its “hard look” burden and properly analyzed the proposed action. The FS has an affirmative duty to disclose that there is significant scientific data that counsels activities proposed by the agencies (CFR 1502.24). When there are impacts that are highly uncertain or there is controversy surrounding the impacts of the proposal, an EIS is required in order to fully assess those impacts (Id 1508.27). In this case, the EIS inadequately addresses this controversy.	Alternative 5 retains high levels of snags and down wood while avoiding salvage in low road density areas (DEIS, p. 38). The silvicultural prescriptions are based on the recommendations made by Beschta, et al (1995). Direct, indirect and cumulative effects are analyzed for all alternatives in detail throughout the document. Because of the importance of the Beschta Report in recent court decisions, the significant issues raised in the Beschta Report and their applicability to the Baked Apple Fire Salvage project are addressed in the DEIS in Appendix C: Issues Relating to Beschta et al 1995.
32	NEPA	Merely listing mitigation measures, without any discussion as to the efficacy is illegal under NEPA. There is absolutely no discussion in the Baked Apple DEIS (or any other document) of mitigation measures implementation, use, and efficacy or anything at all beyond their existence. This is significant because many of the environmental impacts discussed in the DEIS are dismissed because planned mitigation measures or best management practices will eliminate the need to address the impact. The public and the decision maker should be aware	Mitigation measures and Best Management Practices (BMP) are listed and described on pages 48-57 and in Appendix B, which describes the effectiveness of each BMP. Where mitigation is prescribed within the DEIS, the effects are also disclosed (Chapter 3). Examples of this include:

Letter Number	Subject of Concern	Comment	Forest Service Response
		that many of the mitigation measures that the Forest Service employs, are in fact, not particularly effective.	• All temporary roads (legacy and new) would be rehabilitated. The specific mitigation measures include subsoiling the road, pulling berms and placing available harvest slash on the surface of treated roads (DEIS, 157). • Indirect impacts to the great gray owl through changes in prey species are mitigated by leaving dead wood within the planning area to mimic the natural range of variation that prey species utilize. Mitigations include no-salvage buffers and retention trees within units (DEIS, 139).
32	NEPA	NEPA requires a site-specific monitoring and mitigation plan that is missing from the Baked Apple DEIS.	Mitigation measures, monitoring, and Best Management Practices are described by alternative and site-specifically, where applicable, on pages 48-57. Appendix B of the DEIS includes the full Best Management Practices (BMP) checklist, which is also site-specific. In order to identify monitoring more clearly, a different symbol (↗) is used in the FEIS on pages 48-57.
32	NEPA	The Baked Apple DEIS fails to adequately address the cumulative impacts of fuels and fire management, water quality, and other issues with regards to other past, present and reasonably foreseeable actions. The effects of the North Umpqua Complex, Tiller, Calf 2 or Limpy fires, all of which burned nearby nor does it discuss the salvage operation that are likely for these fires. The 1987 Apple fire is not mentioned nor is the aggregated impacts of nearby timber sales, including the Felix, Meow timber sales and the Dry Creek hazardous fuel reduction project also in the watershed. The UNF seems to feel that only projects that are within the arbitrary boundaries of the planning area are relevant to the geographic scale at which to analyze cumulative impacts, the DEIS fails to analyze timber harvest that are very close to the planned Baked Apple salvage units and will have cumulative impacts.	The DEIS addressed all past, present, and reasonably foreseeable actions during cumulative effects analysis. Table 8 displays past activities, including the 1987 Apple Fire and salvage related to that fire. Just below that table, the text describes all of the fires that burned during 2002. Table 9 displays all fire suppression and BAER activities that were conducted for the Apple Fire. Page 64 of the DEIS displays reasonably foreseeable activities, including the Felix/Meow Timber Sales, and the potential for salvage on the Tiller Complex. No salvage or other post-fire projects have been identified for the North Umpqua Complex, Calf 2, or Limpy Fires; therefore, no reasonably foreseeable action is described. Relevant information from these tables was referenced and where applicable, incorporated into the cumulative effects analysis. Cumulative effects are analyzed at different scales depending on the species or ecological

Letter Number	Subject of Concern	Comment	Forest Service Response
			process analyzed. For example, the wildlife biologist incorporated the effects of these past fires in the vicinity of the Apple Fire plus fire-killed habitat available at a broader sale in western Oregon from other fires not salvaged when snag habitat for mobile birds was analyzed. The soil scientist incorporated the effects of the 1987 Apple fire into the cumulative effects analysis for site productivity, since that is analyzed at the site scale.
30, 37	NEPA	Please consider at least one non-commercial, restoration only alternative that invests in restoration and recovery of the fire area. The NEPA analysis fails to consider a minimal restoration and natural recovery alternative. A restorative alternative needs to be considered with the narrow goal of restoration; any commercial salvage would be incidental.	Alternative 1, no action, includes continued reforestation of burned plantations as funds are appropriated and continued road maintenance to reduce potential erosion as needed (DEIS page 16). Alternative 1 includes natural recovery. In addition, in response to scoping, an alternative was considered, but eliminated from detailed study that would have implemented restoration projects, but no commercial timber sale (DEIS page 15). A restoration only alternative would not meet the purpose and need of this project.
30	NEPA	Also, consider an alternative modeled on the recommendations of the Beschta report.	Alternative 5 was modeled after the Beschta report (DEIS page 38).
30, 37	NEPA	The EIS should clearly indicate that the Beschta-like Alternative 5 is ecologically superior to all other alternatives, and that Alternative 3 sacrifices some ecological values but still meets both economic and ecological goals. Commenter indicated that although they believed that Alternative 5 would not be preferred, they thought that there would be some middle ground chosen, since they had participated in good faith.	The consequences, both positive and negative, of Alternative 5 are displayed throughout the document, as are the consequences of Alternative 3. The Responsible Official has chosen to implement Alternative 6, which is responsive to issues and comments received on the DEIS. Alternative 6 salvages less volume than Alternatives 4 and 2, but more than 3, 5, and 1, so it does represent the middle-ground.
37	NEPA	What was the purpose of having open IDT meetings, working collaboratively on a blended alternative, then picking the timber industries preferred alternative (maximum harvest)? Commenter feels sold out and betrayed, and felt that time was wasted given the effort put in to collaboration, which was negated by the choice of the preferred alternative. Alternative 6 should have	The Responsible Official identified the alternative that she felt best met the purpose and need for action for the Draft EIS. After reviewing comments and continued interaction with the public, the Responsible Official has instead chosen to implement Alternative 6.

Letter Number	Subject of Concern	Comment	Forest Service Response
		been chosen, given it was a compromise and addressed all of the issues.	
30	NEPA (WA)	Salvage is not a recommended reason to harvest timber according to the Mid North Umpqua Watershed Analysis. The watershed analysis is supposed to provide a context for decision-making but it is silent on the topic of salvage. The watershed analysis must be updated before this project is approved. It should address issues such as snag retention need to meet long-term snag habitat, large wood recruitment, the historic range of variability of early seral plant communities with abundant snags.	Appendix A of the Baked Apple Fire Salvage fully documents all Watershed Analysis (WA) recommendations that applied to the fire area. The WA was reviewed after the 2002 Apple Fire to determine which recommendations were still valid, which recommendations were no longer able to be implemented, and other areas where the fire changed the existing condition. Whereas the WA did not specifically address salvage, it discusses reasons to salvage (page 119), which includes reducing fuels and restoring landscape patterns. The WA addresses snags (page 65), large wood recruitment (pages 56-62), and the historic range of variability for plant communities (pages 63-65). Snag retention (DEIS pages 110-119), large wood recruitment (DEIS pages 179-186, 201-228), and the historic range of variability (DEIS pages 100-110) are discussed in the DEIS at the site-specific and watershed level.
30	NEPA (WA)	The watershed analysis recommends that the Riparian Reserves should not be harvested (WA page 121). The project is not following this recommendation.	The recommendation in Table 21 on page 121 of the WA applies to green tree harvest. Table 21 specifically states that the general silvicultural information may be updated during project planning with site specific or new information. Given the changed condition of the riparian reserves, this project level planning document updates Table 21.
30	NEPA (WA)	The watershed analysis recommends scheduling work on higher productivity areas first (WA page 123). The project does not follow this recommendation.	The recommendation on page 123 of the WA applies to mid-seral stands that are green and have high site potentials and would realize the benefits of commercial thinning over low site potential stands. This recommendation will be followed for green tree projects. The recommendation does not apply to stands that are burned and dead. Therefore, this project does not

Letter Number	Subject of Concern	Comment	Forest Service Response
			contradict that recommendation.
30	NEPA (WA)	The watershed analysis recommends use of native seeds sources for revegetation projects, but the DEIS relies on planting after logging to get to 85% effective soil cover. The DEIS does not disclose if this will be with native plants and fails to disclose the consequences of using non-natives (altering succession, reduce coverage of natives, out compete planted trees, create future fire hazard), nor the likely ineffectiveness of trying to revegetate from seed in “steep-dry” sites in the late summer (after a May to October operating season). There will be very little germination and growth, before Fall rains wash the seeds (and the soil) away.	All planting (erosion control and rehabilitation) on this forest is obliged to follow the native vegetation plan signed by the Forest Supervisor, Jim Caplan. This document directs only native seed and planting stock, unless waived by the Forest Supervisor on a site specific basis. If a site has been deem to have <85% EGC, then the seeding or planting of that acreage will be done in consultation with a botanist to maximize the effectiveness of seeding or planting.
30, 32	NEPA (WA)	The DEIS lacks any analysis or disclosure of the adequacy of BMPs in a post-fire setting. There is no good evidence that the application of BMPs in the Baked Apple Project area can reduce the impacts of logging and road construction at the watershed scale to an ecologically insignificant level, especially in light of the generally poor existing conditions in the planning area. Nor is there any evidence that they will alleviate cumulative effects at the landscape scale.	Each BMP has been rated for its ability to be implemented and effective. This information has been added to Appendix B.
30	NEPA (WA)	The watershed analysis page 79 fails to describe post-fire landscapes as a specific habitat type. This is a serious omission that requires that the watershed analysis be rewritten before the decision is made.	In fact, the watershed analysis describes post-fire habitat on page 32, and shows a picture of a post-fire stand from the 1987 Apple Fire in Figure 15. Figure 14 on page 31, shows a graphical representation of post-fire habitat. The watershed analysis discusses the landscape-level condition of this habitat type on page 65, last paragraph.
10, 22	NEPA, Economics	The project is progressing too slowly. Deterioration of the timber threatens to affect the viability of the restoration. Keep the merchantability standards high enough to get the most wood moved in the shortest amount of time.	The Forest Service is required by law to complete the planning procedures under the National Environmental Policy Act (NEPA). The requirements take time, involve the public, and require full disclosure of impacts.
30	NEPA/ Water Quality	The EIS indicates that the erosion control plan will be in the timber sale contract, but it should be in the EIS. The agency must provide convincing evidence that logging in this steep, highly erosive, post-fire landscape will not cause increase	Pages 48-57 describe how the potential for erosion will be mitigated. By placing an erosion control plan specific for the Timber Sale Contract (as described on page 55 of the DEIS), the sale administrators would

Letter Number	Subject of Concern	Comment	Forest Service Response
		erosion and sediment in violation of the Clean Water Act and the ACS. Compliance with substantive requirements must be disclosed in the EIS.	have the authority to implement the mitigation described in the DEIS.
26	NEPA/ Environmental Justice	The EIS does not provide any analysis of the communities that will be impacted by the proposed actions nor describes how it was determined that low-income or minority communities will not endure any additional hardships. The EIS should disclose what efforts were taken to meet environmental justice requirements. The EIS should describe the efforts and criteria utilized to identify low income and people of color (minority) communities that may be impacted by the proposed project. The EIS should provide demographic analyses that describes the racial and income profile of the communities that would be impacted by the proposed project and identify those communities that have significant populations of low income and people of color. In addition, the EIS needs to provide a comprehensive accounting of all impacts on these communities, including (but not limited to) cumulative and indirect impacts. The EIS also needs to determine if the impacts to low income and people of color communities will be disproportionately higher than those on non-low income and non-people of color communities. For such a determination, the EIS must identify a reference community, provide a justification for utilizing this reference community, and include a discussion of the methodology for selecting the reference community. If impacted, the EIS should describe the efforts that were taken to assure that these communities have had opportunity to provide meaningful input into the decisions being made about the project. The EIS should describe what was done to inform the communities about the project and the potential impacts in will have on their communities, what input was received from the communities, and how that input was utilized in the decisions that were made regarding the project.	According to statistical data for Douglas County, 6.1% of the population is made up of minorities. As displayed in the Economics section of this document, unemployment and poverty in the county is higher than the State average. Since the project occurs in the middle of the Forest, there are no definable population centers that would be directly affected by the project. The Dry Creek community, which lies about 4 air miles to the east, has a small store that could see an increase in business during logging operations. The rest of the community may potentially be affected by an increase in log truck traffic. The communities of Idleyld Park and Glide, which lie about 25 miles to the west, may also see an increase in business and an increase in traffic. However, none of these increases would be comparable to the logging seen in the area in the late 1980's. No adverse effects would occur. The salvage area is not a high recreation destination area, as described in the recreation section. However, where there is concentrated and dispersed recreation (Apple Creek Campground and Fairy Shelter, plus a few dispersed sites), the effects to those recreating in the area would be greatest. Very few minority groups or low-income groups are found in this area. Because of this, very few individuals of minority populations would likely be affected by this project. Low-income populations who may spend time camping at Apple Creek may also be impacted during implementation when logging occurs. These groups may choose to recreate elsewhere, and would likely not be negatively impacted. However, these effects would end when logging is completed. Overall, none of the alternatives imposes any other additional hardships on minority or low-income communities; therefore, there would be no

Letter Number	Subject of Concern	Comment	Forest Service Response
			direct, indirect, or cumulative effects to environmental justice with any alternative.
26	NEPA/ tribal consultation	The EIS states that the Forest Service consulted with the Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribe of Grand Ronde Indians, and the Confederated Tribe of Siletz Indians. However, the EIS does not provide any specifics regarding these consultations other than to state that the Cow Creek Band of Umpqua Indians indicated full support for the project and no other tribal interests responded to the proposal. The EIS needs to document that treaty rights and privileges are addressed appropriately. As the proposed project may have impacts on Tribes, the EIS should be developed in consultation with all affected tribal governments, consistent with Executive Order (EO) 13175 (Consultation and Coordination with Indian Tribal Governments). EO 13175 states that the U.S. government will continue to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, trust resources, and Indian tribal treaty and other rights. Documentation of these consultations should be included in the EIS. In particular, the EIS should include a discussion of all correspondence the Forest Service has had with the potentially impacted Indian tribes including the issues and concerns raised by the tribes about the proposed project. The EIS should provide the reader with a clear understanding of how the tribes were involved in the decisions that were made to address these issues and concerns.	The Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and the Cow Creek Band of Umpqua Tribe of Indians were contacted by Debra Barner, Heritage Program Manager for the Forest during the Apple and Tiller fires of 2002. The cultural resource specialists for the various Tribes were contacted by phone regarding the burned area and potential damage to archaeological sites. Through telephone conversations by Debra Barner and the Tribal cultural preservation specialists for each tribe a tour was arranged. After a date was selected formal invitations were sent to the Tribes. The week prior to the field trip, Ms. Connie Shultz, Preservation Specialist for the Confederated Tribes of the Grand Ronde called to inform Debra that she would be unable to attend. Mr. Tooter Ansures, Cultural Committee Chairperson and Mr. Thomas Rondeau, Cultural Committee member for the Cow Creek Band of the Umpqua Tribe of Indians were able to attend the field trip on October 15, 2002 to inspect the burned area. The cultural committee members said that they support salvage of the burned area with minimal new road construction. Robert Kentta, Cultural Specialist from the Confederated Tribes of the Siletz was also unable to attend. The Umpqua National Forest has sent a cover letter with the quarterly copies of the SOPA to each of the Tribes. Each quarter, the cover letter highlights new projects and projects that may be of interest to the Tribes; in particular, all fire salvages were highlighted to give the tribes more information. Under the treaties with the Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, and Cow Creek Band of Umpqua Tribe of Indians, no trust resources or reserved treaty rights are given for the

Letter Number	Subject of Concern	Comment	Forest Service Response
			lands managed by the Umpqua National Forest. On January 14, 2004, Debra Barner called Mr. Robert Kentta and Ms. Connie Shultz and left a voice mail requesting to “know whether they had received enough information on our Baked Apple E. I. S. and our timber program in general”. If they needed information, Debra requested that they please return her telephone call. Mr. Kentta and Ms. Shultz did not return her phone call. Debra also telephoned Mr. Tooter Ansures and asked if he felt he had been given enough information on the Forest’s timber salvage effort for Baked Apple timber salvage. Mr. Ansures responded that “he did feel he was given enough information and supported the salvage logging as long as we were protecting archaeological sites”. On January 16, 2004, Debra Barner spoke with Mrs. Sue Shaffer, Tribal Chairman for the Cow Creek Band of Umpqua Tribe of Indians during a meeting on another topic. Mrs. Shaffer said that “yes, they were given enough information.” On January 21, 2004, Debra also spoke with Mr. Tom Rondeau concerning whether he had enough information on the Baked Apple E.I.S. and the Forest timber program. Mr. Rondeau indicated he had enough information and supported the salvage logging.
15	NEPA/other laws	Why does the Forest Service ask for public comment on the Baked Apple Salvage Project when the District Ranger announced at the Senator Smith gathering that you were going to pursue Alternative #4? Is this only lip service to the public in order to satisfy due process?	The Responsible Official chose Alternative 4 for the DEIS because she felt it best met the purpose and need. In response to comments and public involvement, the Responsible Official has chosen Alternative 6 as the preferred alternative for the FEIS.
18, 27	NEPA/other laws	The Umpqua Resource Advisory Committee (RAC) has approved Title II monies under the Secure Rural Schools Act to finance presale activities. The expenditure of Title II monies on a project requires that any revenue generated by that project be deposited in the U.S. Treasury (Public Law 106-393 § 402 (b)). If you accept the RAC’s offer, you will be unable to utilize any	The Office of General Council (OGC) has provided the Forest with their opinion on the Secure Rural Schools Act. According to OGC, the Forest would have to return all money generated from the sale to the Treasury, which would preclude collection for KV and BD. Since this would severely hamper the Forest’s ability to

Letter Number	Subject of Concern	Comment	Forest Service Response
		revenues earned from the sale for reforestation, brush disposal, or other KV work. I recommend you address this in the FEIS. The National Forest Management Act requires that marking of timber “be conducted by persons employed by the secretary of Agriculture”. Further, such persons shall have no personal interest in the purchase or harvest of such products and shall not be directly or indirectly in the employment of the purchase thereof” 16 U.S.C. § 472 (g). I believe “employed by” is synonymous with “employee,” thus eliminating private contractors from marking timber. Thus the Title II funds would not be legally available for the purpose to which the RAC seeks to put them. The Secure Rural Schools Act requires that Title II funds, such as those used in the Baked Apple project, will: “improve the maintenance of existing infrastructure, implement stewardship objectives that enhance forest ecosystems, and restore and improve land health and water quality.” Cruising and marking for Alternative 4 especially is not consistent with the Secure Rural Schools Act because Alternative 4 prioritizes economic return purposes and de-emphasizes the protection and restoration of unsuitable soils and other resource values. Instead, the Title II funds should be used to either maintain infrastructure or enhance forest ecosystems.	reforest the area and implement the project as planned, the Forest has returned the money to the RAC for re-allocation.
27, 30	NEPA/other laws	It is illegal to be commercially exploiting riparian reserves. It is also illegal for the DEIS to not outright admit the reserves are being used for economic purposes. Instead, the only reason the DEIS gives for reserves being logged is “To address fuels concerns... an issue raised during scoping.”	The Record of Decision for the NWFP specifically states on pages C-31 and C-31, that timber harvest is prohibited in the Riparian Reserves, except during catastrophic events (if required to meet ACS objectives) and if watershed analysis determines future and coarse wood needs are met and other ACS objectives are not adversely affected. TM-1 specifically says that the Riparian Reserve acres are not to be included in calculations of the timber base. Alternative 4 proposed salvage on the outer portion of 32 acres of riparian reserves to address fuels concerns,

Letter Number	Subject of Concern	Comment	Forest Service Response
			while leaving enough snags and down wood to meet future coarse woody debris needs. Alternative 6, the preferred alternative for the FEIS, does not include salvage in Riparian Reserves.
27	NEPA/other laws	The Appleseed salvage sale was sold on July 30, 2003, and will be logged before March 2004. All of the Apple Seed units are immediately adjacent to Baked Apple units. Appleseed built .25 miles of new roads within the project area, and cut trees averaging 12 inches DBH on over 100 acres of older managed plantations and young wild stands. A half million board feet was sold. The DEIS mentions Appleseed under “Cumulative Effects” headings, but should have been more specific. For instance, the Baked Apple DEIS says, “The temporary roads built for the Apple Seed project would be decommissioned...”⁷⁰ But some roads built for Appleseed are shown as new “temporary” road construction for Baked Apple. For example, the new road built for Apple Seed unit 23A is the same new road to be built for unit 25 of Baked Apple.	None of the temporary roads built for the Apple Seed salvage sale will be used in any of the Alternatives for the Baked Apple Salvage. The apple seed road initiates from the same point, but it is a different road.
27	NEPA/other laws	The new road into unit 75 is already flagged orange. Alternative 5 would not build this new road. Does this mean the Forest Service has already made a decision not to choose alternative 5? Determining the location of new roads, before you make a decision to build the new roads, is illegal.	The proposed temporary spur road for unit 75 was flagged for reconnaissance purposes, and to visually assist other planners in determining the location of the proposed spur so the site-specific e could be analyzed. There is nothing pre-decisional about flagging potential roads, units, landings, etc. No laws were broken by flagging the potential location of proposed roads.

⁷⁰ Baked Apple DEIS page 236.

Letter Number	Subject of Concern	Comment	Forest Service Response
27	NEPA/other laws	Under The Data Quality Act, Federal agencies must maximize the quality, objectivity, utility, and integrity of information. The guidelines define the term “objectivity” as follows: “‘Objectivity’ includes whether disseminated information is being presented in an accurate, clear, complete, and unbiased manner.” The guidelines conclude that “agencies should not disseminate substantive information that does not meet a basic level of quality. The Baked Apple DEIS demonstrates a bias towards selection of logging alternatives proposed. Therefore, these documents are not “unbiased,” as required by the DQA. For instance, the work has been started on the new road into unit 75, biasing selection of an alternative that includes the new road. The information in the Economic Analysis is missing key elements, such as the funding by the Secure Rural Schools act, or the economic benefits of the beneficial underburning of the Apple fire. Information was also incorrect on the use of the Northern Spotted Owl of burned old-growth. Another example is the claim that alternatives 1, 2, 3, and 5 will increase the risk of a future stand replacing fire while your graphs show otherwise (see reason 6 above). Other mis-information and missing information detailed in our comments above, such as the missing peer review for DecAID, rises to the level of “important” information that the DQA requires the Agency to hold to higher quality standards. Subsequently, the DEIS violate the guidelines implementing the DQA.	The DEIS does not demonstrate bias toward selection of logging alternatives. As stated above, only the location of the road into unit 75 was flagged; no work has been started. Information on the Title II monies was included as a cost in the economic analysis; as stated earlier, the source of the monies is irrelevant to the economic analysis. The beneficial effects of the underburning that occurred throughout the fire were addressed on page 9 of the DEIS; additional information has been added to the FEIS. The information presented on spotted owls is correct and reflects the best available data. Ray Davis, project wildlife biologist, is currently a member of the Regional Spotted Owl review team and is considered to be very knowledgeable about spotted owls and their habitat needs. As stated previously, the DEIS does not claim that a future reburn will occur, but instead documents that if it does occur, it will likely be of greater intensity (DEIS page 82). Use of DecAID was explained on pages 116-119 of the DEIS.
30	NEPA/other laws	The Forest Service has a NEPA obligation to disclose the risk of running out of K-V funds before they are done with the mitigation projects identified in the preferred alternative. If the mitigation and restoration is not completed, the NEPA analysis is no longer accurate and in fact it becomes misleading.	The economic efficiency analysis included sensitivity analyses for risk associated with log prices, loss of volume to decay, and change in discount rate. All alternatives except Alternative 5 remain positive with respect to NPV, including all associated KV costs, at the lower bounds of sensitivity. This indicates that the risk of running out of KV for the preferred alternative is low. The risk of running out of KV for Alternative 5 is high (very likely). The supplemental analysis for log price reduction mentioned above, will display the log price at

Letter Number	Subject of Concern	Comment	Forest Service Response
			which each alternative NPV goes to zero. At these levels, we will display the amount of KV that could still be available, if any.
30	NEPA/other laws	The agency has a conflict of interest. The NEPA document for this project needs to acknowledge that the Forest Service has an inherent conflict of interest when preparing commercial timber sales, and therefore, the action alternative selected is not based purely on legitimate forest health and ecological considerations along. Under NEPA the Forest Service needs to acknowledge that to choose the No Action Alternative or any non-commercial alternative could result in the loss of employment by agency timber planners and others involved in the preparing and deciding this timber sale. So, both the analysis and the decision could be significantly biased. Purpose and need must acknowledge that maintaining employment for agency timber sale planners is really what's at stake here. See <i>Earth Island Institute v. US Forest Service</i> (9th circ Dec 11, 2003).	The National Environmental Policy Act gives the Agencies the latitude to select the purpose and need that best implements their Forest Plans. The consequences of choosing no action are displayed throughout Chapter 3. Choosing no action would not necessarily lead to downsizing within the Agency. Current and future budgetary constraints determine staffing levels. The Umpqua National Forest has experienced significant downsizing over the past 10 years, including the downsizing of those planning timber sales.
34	NEPA/ other laws	Commenter has lost interest in the process and in interacting with the Forest Service. Commenter stated that he felt sold out and betrayed given the decision to go forward with Alternative 4. Commenter was frustrated because he attended all of the public meetings and was present (ad advocated) for the development of the blended alternative (Alternative 6), only to find that the timber industry's alternative was preferred. Why were meetings held and input solicited and a blend developed if industry was to win out?	All public meetings and interactions were conducted to include all potential opinions and interests in the environmental analysis process. The selection of Alternative 4 in the DEIS helps focus comments, and does not preclude selection of another alternative in the FEIS. The responsible official has selected Alternative 6 as the preferred alternative in the FEIS in response to comments, concerns and input by all interested and affected publics.
34	NEPA/ Preferred Alternative	How was the preferred alternative selected? Who selected it? Concern that the preferred alternative harvested the most volume and harvests in controversial areas.	The responsible official selected the preferred alternative in the DEIS (Alternative 4), as she felt it best met the purpose and need. The preferred alternative for the FEIS is Alternative 6.
1,2,3	NEPA/ No Action	Commenters urge the agency to choose the No Action Alternative. Do not log to prevent impacts to salmon, water quality, the fragile environment, etc.	Thank you for your comment. The no action alternative addresses these concerns.

Letter Number	Subject of Concern	Comment	Forest Service Response
30	Noxious Weeds	Opening up the canopy and disturbing the soil through road building and logging as proposed in this project could spread non-native weeds far and wide. The invasive weed sites in the analysis area and along all log and gravel haul routes should be fully inventoried and documented as part of the NEPA process for this project.	The DEIS pages 164-167 document the existing condition of noxious weeds within the planning area and the potential effects of the proposed activities. Locations of noxious weeds were also identified by field personnel during reconnaissance (example: logging systems report). Mitigation described on pages 53 and 57 of the DEIS would reduce the spread of noxious weeds and would help control populations of noxious weeds.
5	Reforestation	The document should clarify that unsalvaged areas may not be reforested due to OSHA regulations.	Riparian reserves that received high intensity fire and that are located within sale area KV boundaries would be reforested except under Alternatives 1 and 5. Approximately 600 acres within riparian reserves would be planted under Alternatives 2, 3, 4 and 6. The District has utilized Categorical Exclusions to reforest in burned plantations where large snags are not a safety concern. Areas that retain snags that will be reforested were evaluated for safety concerns. A discussion of worker safety in areas with retained snags may be found in the Public and Worker Safety section of Chapter 3 in the DEIS (pgs. 286-287).
5	Reforestation	Please clarify the statement under Element 2 of the Purpose and Need that “[s]lash treatment proposal is based on the need to reduce activity-generated and existing dead fuels in order to keep fuel loads within parameters prescribed by the Forest.” Does this apply to all the acres in the project area? How will this be funded?	Slash treatment would occur in salvage units; the work would be paid for with Brush Disposal (BD) funds and would be incorporated into the Timber Sale Contract (DEIS, pg. 6, 18, 24, 30, 38, 51). Other sites with high fuel loads such as burned plantations that are not part of any harvest units, but within timber sale KV boundaries, would be treated using KV funds under separate contracts (not with the timber sale contract) DEIS p. 53.
29	Reforestation	Concern for reforesting harsh sites within the burn is legitimate. Shallow, rocky soils combined with steep south slopes are challenging to reforest but is routinely accomplished throughout southwest Oregon. Incorporating modern forestry tools – namely timely planting with healthy nursery stock and the use of herbicides to control herbaceous and woody plants – increases the likelihood of success. While the legal challenges and agency processes are difficult to navigate, if the desired future condition is a healthy forest achieved in an acceptable	Pages 13, 14, 17, and 18 of the Silvicultural Prescription and page 51 and 52 of the DEIS outline activities that are prescribed to increase survival and growth of planted seedlings. Timely planting of genetically improved conifer stock and release treatments are disclosed.

Letter Number	Subject of Concern	Comment	Forest Service Response
		timeframe, these tools must be utilized.	
31	Reforestation	While the draft considers the replanting on the existing plantations, it effectively makes the decision that land outside the plantations and those outside the action alternative salvage proposals will be left untreated. Since the decision not to treat these lands is a decision with an impact on the human environment, the full environmental impacts of the decision not to treat the remaining acres ($18,000 - (1,600 + 1,432) = 14,968$ acres) should also be discussed in the final EIS.	Pages 52 and 53 of the DEIS document that KV will be collected to reforest lands outside of salvage units that are within the KV boundary. For areas outside of the planning area, not all of the remaining acres that burned did so at high intensity. Within the LSR, about 3000 acres of late-successional stands burned at high intensity, while about 2500 acres of plantations burned. Appropriated dollars are being secured to reforest these areas as funding allows. Unlike the fire behavior that occurred in Matrix land, the LSR burned more patchily (DEIS page 74). Very few areas have large patches of intensely burned areas. Natural seeding is much more likely to occur in these areas, versus what was found in the Matrix land.
31	Reforestation	The quick removal of the dead and dying material is necessary to insure prompt and effective reforestation. As demonstrated by the FIR program, there is a severe reduction in conifer growth if the shrubs are not controlled. It is the recommendation of the Board that all acres that are not within close proximity to a natural seed source be included within the artificial seeding program.	No large scale seeding program will be undertaken with this project. As described above, areas outside of salvage units will be reforested as funding and seedlings are secured.
31	Reforestation	As stated in the report on the Biscuit Fire by Sessions et al. (2003), delays in restocking the area will result in high mortality to seedlings and will necessitate manual release or the use of herbicides to promote growth and achieve desired stocking levels. The FEIS should discuss the need for herbicide use if planting is not done in a timely manner.	The DEIS recognizes the potential delays in reforestation (pages 173-176) and the subsequent effect that would have on forest succession. Page 52 of the DEIS lists measures that would be taken to enhance seedling survival.
31	Reforestation	The public would be well-served by a discussion in the FEIS as to the availability of live seed sources in the burn area and the area that these seed sources are likely to reseed. Further, a discussion of the likelihood of a seed crop in any one year would also be helpful in understanding the limited ability for natural regeneration over this large area.	Natural seeding from green trees is discussed on pages 173-176 in the DEIS.

Letter Number	Subject of Concern	Comment	Forest Service Response
32	Reforestation	The UNF must guarantee that harvest units can be successfully reforested. The courts have ruled that: “The statutory and regulatory language clearly and plainly requires the FS to insure that timber practices will achieve adequate restocking within 5 years”. This mandate has not been met in the Baked Apple DEIS.	Meeting the five-year regeneration requirement under NFMA regulation 36CFR219.27 (c) (3) is disclosed on page 173 of the DEIS. Pages 12-18 of the Silvicultural Prescription and page 51 and 52 of the DEIS outline activities that are prescribed to increase survival and growth of planted seedlings in order to meet this NFMA regulation.
32	Reforestation	The DEIS asserts that natural regeneration will be less efficacious than post-logging regeneration, but the UNF provides no evidence to support this contention, other than the assertion that there are not many natural seed sources (DEIS, pg 174). Spotty natural regeneration would reduce fuel loading naturally.	Pages 173-174 of the DEIS discuss science literature and District monitoring of the Spring Fire that support the fact that planting is necessary to achieve the desired condition of a healthy, productive forest and meet the five-year NFMA stocking regulation.
32	Reforestation	Even the removal of fire-killed late-successional trees denies the future landscape the benefit of legacy late-successional structures, diminishes the structural complexity of recovering stands, and retards the development of future structural complexity and late-successional characteristics. If reforestation after stand replacing events serves to indirectly create future structurally complex older forest, then retaining legacy features makes this happen faster. Salvage logged units will be converted to tree farms. Even if they are not logged at 80-120 years of age (as called for by current management goals), the lack of in-stand disturbance in the replanted forest means they will probably never attain late-successional characteristics.	All alternatives leave some level of legacy late-successional structures in the form of live trees, standing snags, and down woody material. In stand small scale disturbance within the reforested units will still occur. Small scale disturbances include mortality from root disease, insects, competition, wind, and falling legacy trees.
27	Reforestation/ Silviculture	The DEIS should also have disclosed how much of the natural regeneration in the green units will be disturbed by the salvage logging and the treatment of the logging slash.	This information will be disclosed in Chapter 3 under Vegetative Regrowth/Forest Succession.
27	Reforestation/ Silviculture	The “Partial Harvest” prescription in Alternative 3 was never fully explained. We searched the entire DEIS, the silviculture appendix, the logging systems appendix, and the glossary, and no place was there a definition of “Partial Harvest”. All other units have a designated snags/acre retained, except the Partial Harvest units, which have a NA (Not Applicable?) Why aren’t the number of snags per acre applicable in these units? Does the canopy closure of 40 -60% mean that Partial Harvest units will cut all dead trees, but most of the trees in the units are live?	Partial harvest is defined as a logging operation that leaves a majority of the existing live or dead trees standing after harvest. Partial harvest units located in areas that received a low to moderate burn intensity are dominated by green trees. The Silvicultural Prescription on page 8 states “No merchantable dead standing trees will be left in partial harvest units that received a low to moderate intensity underburn.” Non-merchantable snags will be left on these sites. Partial harvest units located in areas that received a high intensity burn are dominated by dead trees and fall under the Beschta

Letter Number	Subject of Concern	Comment	Forest Service Response
			prescription, described on page 38 of the DEIS.
27, 30, 32	Reforestation/ Silviculture	The Forest Service is wasting our money by a massive, nursery stock, replanting program. The post-fire, natural regeneration already on the ground is impressive. The DEIS never explained why expensive nursery stock, tubs, mulch and shade blocking, along with labor costs, is necessary. Some units that are green units, where the few dead trees will be plucked out, have a lot of pre-fire natural regeneration. The DEIS never said why these areas need nursery stock replanting. Is it because the logging slash treatments will kill the natural regeneration? Salvage logging on unsuitable soils is inappropriate in part because salvage logging will set back vegetation recovery that may already be tenuous. The LRMP IV-44 allows for salvage on these sites under certain circumstances and considerations which the FS has not done. Document that the likelihood of mass wasting will not increase. Logging will damage and kill some live trees and other vegetation that currently provide soil cohesion. Salvage will delay the recovery of the next generation of vegetation that must grow and replace the decayed roots the burned vegetation. LRMP IV-203 C5-V, drop the 159 ac of harvest on unsuitable soils. Replanting with nursery stock seriously depletes the genetic diversity at the site. Especially in Riparian Reserves, there is no reason to stuff in a bunch of nursery trees that could have come from all one parent, when the forest has already replanted itself with abundant regeneration from a diverse number of trees in the area. Plant at low density to extend the early seral community and avoid future stand management costs.	Pages 172-176 of the DEIS explains why planting is necessary in areas that received a high intensity burn and have few green trees available for natural seeding. This was based on science literature and monitoring of the Spring Fire. Planting was not prescribed for partial harvest units dominated by green trees. Table 5 in the Silvicultural Prescription shows these units as “no plant”. Salvage on unsuitable soil units are being dropped from Alternatives 4 and 6. The delay of vegetative recovery due to harvest and subsequent prescribed burning is disclosed on page 173 of the DEIS. Other indirect effects are discussed under the appropriate resource heading. A recent study from Oregon State University shows that seedling stocks used for artificial regeneration in clearcut, shelterwood, and group selection stands had significantly greater levels of genetic diversity, on average, than found in natural regeneration. This is probably because the seeds used in artificial seedling stocks come from many wild stands, and thus, sampled more diversity than found in single populations (Adams et. al, 1998). Planting prescriptions vary from 10 to 40 foot spacing. Predicted seedling mortality of 30% to 50% will create patchiness. The desired stocking condition is 250-300 trees per acre at age 15-25 years to avoid the need for precommercial thinning.
30	Reforestation/ Silviculture	The rate and magnitude of vegetation recovery is related to several important management requirements: hydrology, soils, fuels, erosion/sediment (p175), but the EIS gives far too little attention to the fact that salvage logging will set back vegetative	The study referenced in the comment was done on the east side of the Cascades, where vegetation types and processes, precipitation, and temperature are very different than on the west side of the Cascades, where

Letter Number	Subject of Concern	Comment	Forest Service Response
		recovery that has already started and thereby retard attainment of several important management objectives. In research on post-fire logging on the Winema NF, Sexton (1998) found that salvage logged sites produced only about 38% of the understory biomass of that on the unlogged site; and one year later produced only about 27% of the understory biomass of that on the unlogged site. In fact, Sexton's (1998) study comparing salvaged and unsalvaged areas of a fire on the Winema NF one and two years after logging showed: Salvage Areas showed: Unsalvaged Areas showed: reduced vegetation biomass greater vegetation biomass reduced species diversity greater species diversity reduced species richness greater species richness reduced growth of seedlings greater growth of seedlings reduced survival of seedlings greater survival of seedlings	Baked Apple is located. Vegetative recovery is positively correlated with the amount of moisture available. There is at least a three fold increase in precipitation going from the east side to the west side of the Cascades. It would not be valid to use this study to predict the effects of logging on vegetative recovery on the west side of the Cascades. Page 173 of the DEIS acknowledges that vegetative regrowth will be stalled for two to three years in areas targeted for harvest and slash treatment.
5	Riparian Reserves	Who will pay for the felling and fuels treatments in the riparian areas noted in Alternative 4?	KV funds will be collected to fell 2 large trees per acre (DEIS, pg. 51, 53). KV will also be collected to treat the slash in the riparian reserves for the fuels treatment prescriptions.
19, 29	Riparian Reserves	Not all class four streams need to be protected. Class four streams that are fairly rocky and have very little soil movement do not need a buffer. The soil type will determine if the stream needs protection. There are also a few draws or class four streams that only run water when there are at least three inches or more of rainfall occurring in one day. Harvesting is required to reduce the buffer area's risk of another devastating fire that will most definitely take place if the problem is not dealt with.	The responsible official determined that no salvage logging would occur in riparian reserves at the onset of the project (Project Initiation Letter, 3/7/03). In response to scoping, Alternative 4 addressed fuels concerns in riparian reserves by removing some volume and felling and burning smaller diameter trees along Class III and IV streams.
19	Riparian Reserves	Riparian buffers will inhibit the comeback of oaks growing in rocky meadows. Harvesting is strongly encouraged around rocky meadows to encourage the comeback of oak habitat.	No salvage is prescribed in Riparian Reserves under the preferred alternative for the FEIS, Alternative 6. No salvage will occur in unsuitable soils units, as these areas were dropped from consideration. Existing meadows that burned will experience regrowth of native species, including oak.
7	Riparian Reserves	Today's logging equipment also allows for the removal of material in riparian areas.	Salvage in Riparian Reserves is included in Alternative 4 (DEIS, pg. 30-33).

Letter Number	Subject of Concern	Comment	Forest Service Response
9, 12, 13, 14, 30	Riparian Reserves	Riparian Reserves should be managed only for aquatic and wildlife values, not economic incentives. The Forest Service admits to leaving behind the smaller trees and selling the larger trees for economic benefits. Riparian Reserves should be managed only for aquatic and wildlife values and not for economic incentives. The logging in Riparian Reserves would cut and leave on the ground trees 8 to 12 inches diameter, but cut and sell trees 12 to 18 inches in diameter. Leaving behind the smaller trees and selling the larger trees, the Forest Service admitted, is for economic benefits. Riparian areas are important, sensitive zones for the health of forests, watersheds, and wildlife. Goals of this sale can be achieved without the minimal contribution that the logs in the riparian areas would provide under Alternative 4.	Alternative 4 includes salvaging trees in Riparian Reserves (DEIS, pg. 58). No other alternatives include salvage within riparian reserves. The removal of trees 12” to 18” in diameter from 32 acres of riparian reserves was in response to an issue raised during scoping (DEIS page 11). The 12” to 18” trees would be removed and sold because it is not feasible to cut, pile, and burn trees greater than 12” in diameter. The removal of these trees from the 32 acres was driven by fuels objectives, and would yield less than 780,000 board feet of timber. The fisheries biologist concluded that this limited amount of removal from the riparian reserves would not adversely affect ACS objectives. The wildlife biologist concluded that current and future coarse wood needs would also be met by the retention of all trees greater than 18” in diameter. This complies with the ROD Standard and Guideline TM-1. No salvage in riparian reserves is prescribed for Alternative 6, the preferred alternative for the FEIS.
27, 32	Riparian Reserves	In the riparian reserve harvest of Alternative 4 why are the smaller trees left, while the larger trees sold, since smaller trees are a greater fire hazard than larger trees? The DEIS gives no ecological justification for commercially selling trees of this size out of reserves. The outer half of the reserves especially serve as a corridor for old-growth dependent wildlife and selling 18 inch trees does not benefit that habitat. Because we raised this issue in our meeting, a written explanation for leaving the smallest and selling the largest of what is cut in reserves, was emailed by Steve Bacigalupo: “The objective would be the same as the harvest units in terms of fuels reduction. Reduction of future fuels accumulations caused by the falling of snags. By removing that material future	In response to scoping, Alternative 4 was created in part to address the issue of maintaining high fuel loads within riparian reserves that are adjacent to salvage units. Only areas adjacent to salvage units were included in Alternative 4 in order to feasibly implement the fuels prescriptions and to maximize the opportunity to use KV funds to meet resource objectives. The fuels objective in the riparian reserve is the same as the upland salvage units in terms of fuels reduction: reduction of future fuels accumulations caused by the falling of snags. By removing that material, future build-up would be reduced, reducing intensity of future fire caused by larger fuels being consumed, by longer duration fire. This treatment, in conjunction with the

⁷¹ Northwest Forest Plan. C-36. FM-4.

Letter Number	Subject of Concern	Comment	Forest Service Response
		build-up would be reduced, reducing intensity of future fire caused by larger fuels being consumed, by longer duration fire. This treatment in conjunction with the fuels treatment of the smaller material will diminish fire behavior.” This explanation fails to explain anything – especially why smaller fuels are being left, which are more vulnerable to ignition and spreading fire, than the larger fuels being yarded and sold. And, the “reburn” theory eluded to in this response is unfounded (see reason 6). And lastly, if there is any explanation at all to selling the largest of the trees cut in the Riparian Reserve, it should have been in the DEIS for everyone to see. It is illegal to commercially log Riparian Reserves for economic purposes. You can only log in Riparian Reserves “to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.” The DEIS never explained how selling larger trees while retaining smaller trees met the ACS objectives. Salvage in reserves is only allowed when “watershed analysis determines that present and future coarse woody debris needs are met and other ACS objectives are not adversely affected.” The DEIS never pointed to any place in the Watershed Analysis that made these determinations for the size of trees being sold. The ACS determinations in the DEIS never documented how the prescribed burns of logging slash in the Riparian Reserves contribute to ACS objectives.⁷¹ According the NWFP standards and Guidelines, the FS can adjust RR in cases of catastrophic fire (S&Gs p C-32). The Forest Service does not demonstrate that reducing riparian reserve width is necessary to meet ACS objectives. Logging 32 acres in RR is not going to significantly modify fire behavior and protect the RR from fire.	fuels treatment of the smaller material, would diminish future fire behavior. The smaller trees would be felled, piled, then burned in order to further reduce fuel loads (DEIS page 30). The eighteen inch maximum diameter limit would allow fuels to be removed, but would retain the larger wood that is considered most important for wildlife and riparian objectives. See response to comment above for further discussion of how the project meets ACS objectives. The project is not modifying riparian reserve width. It is proposing, in one alternative, to conduct fuels reduction activities within portions of the riparian reserves, in order to respond to an issue raised during scoping.
27	Riparian Reserves	The DEIS never tells us the current condition of the Riparian Reserves. How many trees larger than 18” would be left? In the reserves we looked at, we didn’t see many. It could be the Forest Service is selling, for the most part, the largest trees in the Riparian Reserves. The DEIS also never tells us how many acres will be logged commercially versus how many of acres in	The current condition of the riparian reserves is discussed throughout Chapter 3 of the DEIS. Pages 181, 184-186, 213-217, and 223 all document the condition of the reserves in terms of burn severity and treatments prescribed.

Letter Number	Subject of Concern	Comment	Forest Service Response
		the Reserves will receive fuel reduction without commercial extraction.	The silviculture report, DEIS Appendix D, describes the biological and physical condition of the Riparian Reserves (Table 1 pages 5-7). On average, there are 44 trees greater than 20 inches in diameter. Further analysis of stand exam data shows that there are approximately 30 trees per acre above 18" within the reserves. Page 223 summarizes the acres treated in riparian reserves. This information is clearly stated under the description of Alternative 4 in the FEIS.
27	Riparian Reserves	The DEIS never told us why Fuels Treatment units were needed, why these units were chosen over other Riparian Reserves, and why it was only needed in Alternative 4. If it raises the fuel reduction capabilities of alternative 4 so that it is the only choosable alternative, it is unfair to exclude this measure from the other alternatives. The Forest Service should have analyzed an alternative that excludes commercial harvest in the Riparian Reserves, but includes the non-commercial fuels treatments.	The riparian treatments were in response to issues conveyed during scoping and fit best into alternative 4. The fuels objective in the riparian reserve is the same as the upland salvage units in terms of fuels reduction: reduction of future fuels accumulations caused by the falling of snags. By removing that material, future build-up would be reduced, reducing intensity of future fire caused by larger fuels being consumed, by longer duration fire. This treatment, in conjunction with the fuels treatment of the smaller material, would diminish future fire behavior. The smaller trees would be felled, piled, then burned in order to further reduce fuel loads (DEIS page 30). The eighteen inch maximum diameter limit would allow fuels to be removed, but would retain the larger wood that is considered most important for wildlife and riparian objectives. This was included in Alternative 4 as a response to scoping. NEPA requires a sharp contrast between alternatives; to include every aspect of every issue in all alternatives would result in not having a reasonable range of alternatives. Alternatives 2, 3, 5, and 6 do not include commercial salvage within the riparian reserves; Alternative 6 does include the use of fuel breaks, but these are outside of riparian reserves.

Letter Number	Subject of Concern	Comment	Forest Service Response
30	Riparian Reserves	The preferred alternative is unclear on the fate of trees >18 inches dbh in the Riparian Reserve logging.	All trees greater than 18 inches in diameter will be retained within the riparian reserves under Alternative 4. The only exception to this would be trees that are designated as hazard trees, which would be felled and left in place.
24	Riparian Reserves	The Northwest Forest Plan directed that “interim” buffers around intermittent and ephemeral streams be reviewed and narrowed from the original designation upon completing a watershed analysis. That review has still not occurred, and as a result, substantial acreage of dead timber that has little or no impact on water quality has been arbitrarily taken off the table for consideration for restoration activities. The range of alternatives needs to be expanded to include salvage and restoration of the “interim” riparian areas on intermittent and ephemeral streams burned in stand replacement fire. Even though such an alternative may be impossible to implement because of the lengthy consultation process with NOAA, the public deserves the right to know the extent of these areas and why these areas are off limits.	The Middle North Umpqua Watershed Analysis (2001) did not determine a need to adjust riparian reserve width. In response to scoping, salvage of some burned timber within the outer portions of riparian reserves was considered in Alternative 4 (DEIS page 30-33). An alternative to salvage within all riparian buffers was considered, but eliminated from detailed study (DEIS page 15).
31	Riparian Reserves	The Umpqua National Forest Land and Resource Management Plan Prescriptions for riparian areas specifically authorizes salvage harvest within the riparian areas of Class 1 and 2 streams when there is a catastrophic event (See Prescription C2-1, Forest Plan IV-169 to 171). The FEIS should clarify that salvage within the riparian areas is necessary to move these areas to the desired future condition and natural variability. The ROD should also clarify that the salvage in these areas is authorized by the LRMP, given that the post fire condition is not within the range of natural variability.	Salvage is proposed within riparian areas of Alternative 4 to move these areas toward desired conditions that reduce fuels in the future to a condition that is safer and more controllable during fire events (DEIS, p. 99, Fire Effects and Behavior for Action Alternatives). Effects of proposed harvest and fuel treatments on fuel conditions will move current conditions toward Fuel Model 11 in the long term (DEIS, p. 96), a condition where fire behavior is easier to control compared to Fuel Models 10 and 12, the most common fuel conditions expected to occur in the surrounding landscape (DEIS, p. 78, Table 14, p. 96, Figure 35 and p. 98, Table 26).
30	Riparian Reserves	The EIS has conflicting findings on aquatic impacts of logging. It says on page 212 that no alternative will prevent attainment of ACS objectives, but then on page 219 the EIS indicates that there will be cumulative effects on large wood and fluvial erosion. Since there is a deficit of large wood in streams (p 241, 248) and since large wood has a “profound effect” on stream morphology (p 213), any loss would retard or prevent ACS	The statement on DEIS pg. 212 states that “none of the Baked Apple alternatives are expected to prevent attainment of ACS strategy objective #5 by changing the sediment regime associated with landslides, and none would degrade the watershed condition indicator of management related landslides considered by NOAA Fisheries in the short term.”

Letter Number	Subject of Concern	Comment	Forest Service Response
		attainment.	Throughout Chapter 3, the FEIS clarifies the scale of aquatic impacts in terms of magnitude and duration (long vs short term) in order to properly address the Aquatic Conservation Strategy. Under all alternatives, sites with substantial risk to shallow-rapid landslides have been identified from slope stability modeling with subsequent field investigation. Verified areas of unstable or potentially unstable ground were deleted from salvage logging. This would allow for large wood to be recruited to the riparian from these steep unstable slopes should a slide occur. Large Woody Material was added to the lower mainstem of Limpy Creek, lower Bachelor Creek, and the tributary channels of Panther, Limpy, Fairy, and Bachelor Creeks as part of the BAER restoration effort. One hundred and twenty-five large logs were placed in approximately 3.5 miles of lower Limpy and Bachelor Creeks. In addition approximately 8 miles of tributary channels had large wood added. No trees will be removed from within one site potential tree height (180 ft.) of any stream channel. No trees greater than 18 inches in diameter would be removed from the 32 acres of riparian treatment proposed in alternative four. Refer to the DEIS Appendices, Fisheries Biological Evaluation and pages 31, 207-208 in the DEIS.
30	Riparian Reserves	The EIS analysis of ACSO #1 (p 102) is inaccurate. Salvage will in fact reduce the complexity of landscape features and reduce a rare habitat type (early seral with snags) below the historic range of variability. This has a direct connection to aquatic habitat because such areas likely contribute disproportionately to large woody debris accumulations in streams, especially in steep watersheds like those in this project area.	The DEIS discloses that pre-fire landscape features were composed of smaller-sized patches representing a more diverse and fragmented landscape than under estimated natural conditions and how these patterns changed as a result of the fire (page 101, DEIS Figure 36, caption). The DEIS states that, “The acreage of early-successional habitat that is not being impacted (salvaged or planted), covers about 17-28% of the planning area. This is still higher than the estimated natural range of variability for this type of habitat” (page 105). The DEIS also states that “Under all alternatives,

Letter Number	Subject of Concern	Comment	Forest Service Response
			over 50% of the existing fire-created habitat within the planning area would not be harvested; these are the areas not proposed for salvage. This habitat type remains well distributed across the planning area with the Riparian Reserve network and as scattered patches” (DEIS page 104).
30	Riparian Reserves	The EIS analysis of ACSO #2 (p 102) is inaccurate because it fails to address the connectivity between upslope and stream systems. Roads are a major interceptor of logs and other material destined for streams. This project not only proposes to use and maintain many roads that interfere with this connectivity, it also proposes to build more new roads that may serve to exacerbate this adverse consequence.	Existing roads do intercept material - at stream crossings, where movement of material already in the stream can be restricted, and on slopes near riparian areas, where falling material lands on the road that might otherwise reach the stream. None of the alternatives will exacerbate these effects. Compared to the existing condition, use and maintenance of the existing roads will not further reduce the amount of woody material entering streams. Essentially all the large diameter logs that were intercepted by roads (especially within riparian reserves) during fire suppression activities were conserved and placed into burned area streams during burned area emergency rehabilitation. All new roads constructed with the project are temporary roads and are not located near streams or riparian areas. They will not intercept material that would otherwise enter streams.
30	Riparian Reserves	The EIS analysis of ACSO #5 (p 201) fails to consider the effect of delayed vegetation recovery, increase logging related ground disturbance, and how these will affect the rate and timing of erosion and sedimentation. The EIS also says that roads and logging related sediment should be “expected” (p 201).	Page 201 of the DEIS is an introduction page to the subject of “Erosion and Sedimentation – Tracked as a Significant Issue”. The analysis that follows (pages 202 – 329) addresses each type of erosion and its potential origin and fully discloses the Affected Environment, Direct Effects, Indirect Effects, Cumulative Effects, and Conclusions. Vegetation within the riparian zones will be largely left undisturbed. Only one alternative allows for 32 acres of riparian harvest. No vegetation would be removed from within the first site potential tree of any stream channel. Vegetative regrowth here coupled with appropriate

Letter Number	Subject of Concern	Comment	Forest Service Response
			logging systems, BMP's, maintaining effective ground cover, and applying mitigation where necessary is expected to significantly reduce the potential for sediment to reach area streams. The fact that the salvage logging is expected to increase erosion is disclosed on page 224 and 225 of the DEIS. This disclosure is further developed in Chapter 3 of the FEIS. None of the Baked Apple alternatives would affect the sediment regime associated with the surface erosion process at the scale of the 5th field watershed over the time-frame of decades or longer. The various action alternatives would cause short-term adverse effects on the surface erosion process due to disturbance of recovering post-fire vegetation from logging and slash burning, yet this impact is not expected to last any longer than a few years. The salvage activities, including slash burning, is not expected to cause any appreciable change to the sediment regime from surface erosion over the long-term since vegetative recovery in the form of pioneering ground cover (moss, grasses, herbaceous plants, and sprouting hardwoods) recovers quickly to hold surface soils in place.
30, 32	Riparian Reserves	The EIS (p 248) falsely claims to have no effect on LWM entering streams. The EIS (p253) admits that the preferred alternative has a risk of landslides occurring on salvaged sites so they won't deliver the large logs needed by the streams. The ACS objectives will also be violated because some areas that will experience debris flows will be inaccurately identified as stable and will be logged. Those trees should be in the stream but instead will be taken to the mill. The EIS fails to address the uncertainty associated with predicting landslides and the consequences of that uncertainty (p208). The preferred alternative includes over 10 acres of unstable sites in harvest units. This will deprive some streams of large wood in violation of the ACS.	The uncertainty associated with predicting future sites of landslide activity is discussed on pages 208 and 209 of the DEIS. The 10 acres under Alternative 4 (and 6 acres under Alternative 6) are not definitively known to be unstable or even potentially unstable. The acres of instability shown in Table 53 of the DEIS on page 209 represent the aggregation of many very small, scattered points that may or may not actually be unstable. The field work completed by the interdisciplinary team focused on all of the larger discernable swales. Though the SHALSTAB mapping has a relatively high degree of accuracy because of the 10 meter resolution of the digital terrain model, not all sites identified by the model were determined to presently be at risk of slope

Letter Number	Subject of Concern	Comment	Forest Service Response
		The EIS (226) claims that retaining upland trees will cause an unacceptable risk of intense future fires in riparian areas (from trees falling and moving from upland to riparian areas). If this is true, then failing to retain such trees will violate ACS objective #8 related to instream wood. The DEIS claims that logging under the preferred alternative will not lead to landslides as trees are dead. Later the DEIS states the correct assertion that Alternative 5 carries less risk of landslides because it leaves substantial amounts of dead trees. More support that the preferred alternative risks mass wasting can be found in the DEIS on page 24, where the UNF reveals that Alternative 5 would not log units 16, 27A, 27B, 38, 70, 71, 86, and 90, because these units (all of which are included in the preferred alternative) have the potential to cause landslides.	instability for shallow rapid landsliding. Nevertheless, each alternative contains a different mix of proposed salvage sale units that have varying sensitivity and susceptibility to mass wasting potential with associated risk of removing dead trees that might someday be delivered in a landslide to a stream or that would function to slow the momentum of a debris flow (Lancaster et al. 2001). Salvage logging under any of the action alternatives will not increase the chances of landslides because the trees to be salvages are dead and dead trees do not provide root strength once the root systems begin to decay. The impact of salvage logging to the landslide process is that if a landslide were to occur in an area that was salvaged, the dead trees would not be available to function within the slide and/or be delivered downslope to a stream if the slide should travel that distance. Sites at substantial risk to shallow-rapid landslides have been identified from slope stability modeling (SHALSTAB digital terrain model) with subsequent field investigation. Verified areas of unstable or potentially unstable ground were deleted from salvage logging. The reason units 16, 27A, 27B, 38, 70, 71, 86, and 90 were dropped from Alternative 3 was to further lessen the combined risks of surface erosion and the chances of having an unidentified headwall area slide without the dead trees (DEIS page 209). These units were identified as having some risk of that occurring, though field reconnaissance found no identifiable headwalls.
32	Riparian Reserves	DEIS fails to ensure that stream temperatures do not increase from salvage logging and violates ACS. RR moderate ambient air temperatures which can influence stream temperatures.	Only Alternative 4 proposes salvage within the RR. Stream shade reduction along class 1 and 2 streams under this alternative would be immeasurable and stream temperature increases would be negligible at this scale (DEIS, pg. 184). Ambient air temperature

Letter Number	Subject of Concern	Comment	Forest Service Response
			influences from removing dead trees from outside the primary shade zone would have no affect on the resulting stream temperatures.
32	Riparian Reserves	Stream channels in the planning area are lacking in down woody debris (DEIS p 204), and the DEIS's failure to address how logging future large woody debris and hauling it offsite does not impact future large woody debris recruitment violates the ACS. The preferred alternative would log in riparian reserves delineated by the NWFP. Logging would occur within 75 feet of Class I fish bearing streams, where normally there would have been a 360-ft buffer (DEIS, p. 30). The DEIS does not address how the logging activities will affect future large wood recruitment.	No timber would be removed from the site within 180 feet of any stream channel (DEIS, pg. 254). None of the Baked Apple alternatives would appreciably affect recruitment of large wood material (DEIS pg. 255). The alternative selected in the FEIS, is Alternative 6, which does not salvage in riparian reserves.
26	Riparian Reserves	The preferred alternative is the only proposed alternative that calls for timber harvesting in riparian reserves. The preferred alternative would allow for the removal of trees within the 360' buffer of class I and II streams and within the 180' buffer of class III and IV streams. The justification for logging in riparian reserves is to maximize economic efficiency and reduce fuel loads. The only mitigation measure proposed for logging impacts within the riparian reserves is the scattering of slash within the inner 50' of the stream buffer. However, a significant amount of the harvesting in the riparian reserves is to be performed via helicopter logging which has the least amount of impacts of the three proposed logging techniques. While provisions exist in the Forest Plan that allow for some salvage logging in riparian reserves, logging impacts could exasperate stream temperatures that are currently elevated in the Panther Creek sub-watershed, degrade water quality through the introduction of sediments and nutrients and delay the recovery of some habitat functions. It is recommended that harvesting with the riparian reserves be limited to helicopter logging. Utilizing helicopter logging will assure that logging impacts will have minimal impacts on the aquatic systems and their dependent species.	The rationale for salvaging within the riparian reserves is described previously. The preferred alternative for the FEIS, Alternative 6, does not salvage within the riparian reserve.

Letter Number	Subject of Concern	Comment	Forest Service Response
32	Riparian Reserves	The National Marine Fisheries Service (NMFS) has found the riparian reserves in the area to be “not properly function (DEIS p. 245).” Further impacts to riparian reserves will lead to a jeopardy call for the listed fish species in the area.	Page 245 of the DEIS states that the Riparian Reserves within the Panther Creek sub-watershed are “Functioning at Risk”. Only Alternative 4 proposes harvest activity within the riparian reserve. Thirty-two acres have been identified in this alternative for treatment in response to fuel loading and future fire risk. None of these acres occur within one site potential tree height (180 ft.) of any stream channel. By reducing site specific risk of future fire riparian conditions can become more resilient to future fires and move more quickly toward advancing riparian conditions and ACS objectives.
32	Riparian Reserves/ Wildlife	Logging in Riparian Reserves will disrupt connectivity for terrestrial species. The DEIS must consider the impact to thermal ground cover, habitat connectivity, refugia for species with limited dispersal capabilities and opportunities for species such as the northern spotted owl.	The second paragraph on page 102 of the DEIS discusses connectivity for terrestrial species and how the project affects it. Page 121 discusses dispersal habitat for the spotted owl. The project does not remove any dispersal habitat for the owl (pg. 122).
30	Roads	No roadbuilding please. Roads harm wildlife, spread tree diseases and bark beetles, promote insect infestations, cause invasion by harmful non-native plant and animal species, damage soil resources and tree growth, and adversely impact aquatic ecosystems. For the semi-permanent roads that will be tilled, BLM's own scientist has little faith in the restorative value of this technique.	The temporary roads will be subsoiled with organic matter returned to the surface of the road (p 156 DEIS). The practice of providing organic amendments “would likely enhance both the short-term effectiveness and durability of gains” accelerating restoration of the roads, hydrologic and ecological function.” (Luce, 1997) Site specific prescriptions for all temporary roads are included in the FEIS. Dale Stewart, BLM Soil Scientist and author of cited document, states the reference was specifically to a given piece of equipment and its ability to restore temporary roads, not the general ability to rehabilitate such roads.
26	Roads	While none of the proposed action alternatives would build any new permanent roads, none of the alternatives would decommission any permanent roads and therefore road density would not change. The direct and indirect environmental impacts from roads is well documented with increased sedimentation to waterbodies being potentially the largest direct impact. While the EIS proposes	A project level roads analysis was conducted for the project (July 2003) and is on file at the North Umpqua Ranger District. The Responsible Official made the decision to eliminate all road work except that necessary to conduct safe timber haul in order to not trigger a “Likely Adversely Affect” (LAA) determination for coho salmon which was listed as threatened during the planning of this salvage project. A LAA

Letter Number	Subject of Concern	Comment	Forest Service Response
		actions that will reduce existing road impacts (e.g., reconstruction at milepost 4.41 and road 4714), maintaining greater than 3 miles per square mile road density in the project area will prevent it from becoming a properly functioning fisheries habitat. It is recommended that the EIS include provisions in the action alternatives that decommission roads to a level that meet NOAA-Fisheries criteria for properly functioning fisheries habitat.	determination would have resulted in a lengthy consultation process, which would likely have resulted in decay rates that would make the project uneconomical. The DEIS page 53 discloses that KV monies would be collected to decommission and repair roads, which would require a separate NEPA decision. However, the Office of General Council (OGC) has informed the agency that this would not be feasible; therefore, this has been removed from the FEIS. The “not properly functioning” condition of the road densities is not further degraded by the project.
30	Safety	Hazard tree removal must not be used as an excuse to get timber volume. Truly hazardous trees located in high use areas should be felled (often leaving a high stump for wildlife) but such trees should generally be left to provide for wildlife and soil needs. The NEPA analysis also fails to acknowledge that the public assumes certain risk when recreating on public lands, so not every hazardous tree on every dead end spur road needs to be felled and removed. See ORS §§ 105.672(3), 105.682(1) and Brewer v. ODFW, 2P.3d 418, 167 Or. App. 173.	The purpose and need on page 5 of the DEIS partially focuses on economics, which the felling and removal of hazard trees would contribute to; approximately 1 million board feet of timber would result from the salvage of these hazard trees in Alternative 4, which addresses the most area of hazard trees. No high use recreation areas within the analysis area exist. The public assumes some risk by traveling in areas where the trees were killed by fire. The Forest Service has placed signs in the area that describes the risk from fire killed trees. Only roads where there would be log truck traffic would be evaluated for hazard trees; not every “hazard tree” would be felled.
31, 38	Safety	An important topic not addressed in the DEIS is the safety issues created by standing dead and dying material. It would be difficult under OSHA rules for the Forest Service to maintain recreational roads and trails in the area. We suggest that the Forest Service discuss the safety implications of the dead standing timber on both the Forest Service employees, as well as the forest users.	Pages 286 and 287 describe safety issues related to salvage. Retention of standing dead trees within proposed salvage units, along system roads, and areas not proposed for salvage will continue to deteriorate over time. Exposure to hazard trees will be minimized under

Letter Number	Subject of Concern	Comment	Forest Service Response
		This standing dead timber also becomes a serious safety hazard the longer this project is stretched out, especially with the helicopter logging. Many of these dangerous snags may now need to be felled for safety of the hooking crew. This is a cost that should be allowed for in your appraisal.	all alternatives; however, not all hazards can be identified. All people who enter the fire area can be expected to be exposed to hazard trees and appropriate signs have been installed at key locations to help identify these hazards.
31	Safety	The DEIS in pages 286-87 discusses the need to fell danger trees along system roads. It should also discuss the impact of not felling danger trees along trails and other recreation sites. Given the need to keep the road and trail systems open, we suggest that road and trails be cleared of hazard trees through the use of Categorical Exclusions.	All danger trees along the haul route will be identified and felled. Danger trees are routinely assessed throughout the District in recreation sites.
30	Safety	Why are hazard trees being felled for this project? Weren't they felled during firefighting?	Trees that are determined to be a hazard during all phases of logging operations will be felled as per Oregon OSHA guidelines to provide for worker safety (DEIS pages 286 and 287). Trees which were determined to be a hazard were felled during firefighting. However, as trees continue to decay over time, additional trees which were not deemed to be a hazard will become hazards due to decay and as other types of work during different seasons and time periods.
30	Safety	The EIS indicates that leave trees cut for safety purposes "may" be replaced. This should be "shall."	Any marked leave trees which are cut for safety reasons within harvest units will be left on site.
5	Science	What regional direction is given regarding the incorporation of the Beschta report?	No official direction exists that states that salvage environmental analyses must incorporate the Beschta Report. However, the Region has suggested that the Report be considered. On September 2, 1995, Deputy Chief of the Forest Service Gray Reynolds issued a memo to all Regional Foresters that stated the importance of both the Beschta report and the Forest Service Research Branch's review of the report in the discussion of the timber salvage issue. To further clarify the need to address Beschta, Regional Forester Harv Forsgren re-iterated the importance of including a

Letter Number	Subject of Concern	Comment	Forest Service Response
			discussion of the Beschta report in post-fire salvage NEPA documents (Memo dated February 20, 2002). In addition to these memos, recent court cases have also elevated the importance of thoroughly considering the Beschta Report (League of Wilderness Defenders – Blue Mountains Biodiversity Project, and Cascadia Wildlands Project, v. USFS (Crane Prairie Salvage) – No. 02-728-JE; Sierra Club v. Bosworth (Meagram Salvage) No. 01-3901-MMC; League of Wilderness Defenders v. Forsgren (Hash Rock Salvage) – No. 01-1819-HA).
35	Science	The commenter states that the 50% retention value in Beschta et al. was expert opinion. From an ecological standpoint, it seemed like a reasonable first approximation. The proviso that it be distributed across all size classes was provided by Wayne Minshall.	Alternative 5 was developed to reflect this opinion.
30	Science (wildlife)	The logging will adversely affect designated big game cover MA 11 in violation of the LRMP. a. The EIS fails to show where the Big Game MA 11 is in relation to the harvest units. b. The Forest Service fails to recognize and protect the value of large snags as big game cover. c. The Forest Service fails to recognize the unsalvaged post-fire areas will provide far superior mosaic of cover and forage than salvaged areas. d. The EIS (p 136) recognizes that human disturbance can cause big game to abandon otherwise suitable habitat. This risk should not be taken in designated MA 11. e. Page 136 of the DEIS indicates that >20% of the big winter range should be in optimal cover, but the EIS does not say how much currently is optimal cover. (The EIS says 40% for the planning area, but does not disclose the amount of cover within the winter range portion of the planning area). Since the fire severely reduced cover, what little cover remains in the form of large tree boles should be retained, not removed making a bad situation even worse for big game. f. The EIS admits that dead trees do provide cover value for big game (citing Fire Effects Information System) but the Forest	The DEIS states that the salvage will cause impacts to winter range, but that the impacts are not significant (pg. 137). No maps of winter range were provided in the DEIS. However, the spatial arrangement of winter range management area locations are discussed in the affected environment section on page 136. The WEEP document, which is incorporated by the EIS on page 1, shows a map of winter range quality in relationship to the 2002 wildfires (Fig. 41, page 52). The DEIS clearly states that dead tree habitat provides cover on page 136 and 137. And that harvesting of standing dead trees would result in indirect impacts to big game by reducing their [tree] density and thus impacting their effectiveness as hiding cover. This hiding cover is protected in Riparian Reserves and other non-harvested areas within the planning area. There is no science we are aware of that indicates that unsalvaged post-fire areas are “far superior” mosaics of cover and forage than salvaged areas. The arrangement of cover areas and forage areas is an important aspect to the suitability of the habitat for elk

Letter Number	Subject of Concern	Comment	Forest Service Response
		Service does not explain why they can just destroy so much of what little cover remains in this winter range. See FEIS Elk narrative: http://www.fs.fed.us/database/feis/wildlife/mammal/ceel/fire_effects_and_use.html g. The LRMP requires that opening should be limited to 20 acres to enhance patterns of cover/forage, but there are many harvest units that are directly adjacent to each other and will make many openings much larger than 20 acres. h. The forest plan requires that the Forest Service use a habitat effectiveness index when planning timber sales. This was not done.	use. The DEIS does state that enough cover will remain well-distributed throughout the planning area. The DEIS (pg. 136) does recognize that human disturbance may have a direct effect to big game. However, this effect is temporary and permanent abandonment is not common...big game would likely return once harvest operations are completed. The standards and guidelines for MA-11 do not preclude human disturbance within this land allocation. The S&G's require seasonal restrictions (between Dec. 1 – April 30) if unacceptable impacts to big game animals are expected to occur. The DEIS does not consider this impact significant. The 40% value in the DEIS refers to the percentage of cover within the winter range allocation (MA-11) that occurs within the planning area. This percentage increases significantly when considering the entire MA-11 land allocation on the forest. The Forest Service is not “destroying” what little cover remains in winter range. As stated in the previous discussion, 40% of the winter range management land allocation (MA-11) that occurs within the planning area will have cover habitat. The LRMP does not require that openings be limited to 20 acres. What the LRMP says is that “unit size will average 20 acres or less” (pg. IV-195). Exceptions for salvage are allowed. The DEIS clearly states that the average salvage unit size (including adjacent units) is approximately 11.5 acres under all action alternatives (pg. 136). It also states that riparian buffers would maximize edge of dead tree habitat, which provides some cover. There is no Forest Plan requirement to use a habitat effectiveness index when planning timber sales.

Letter Number	Subject of Concern	Comment	Forest Service Response
30	Science (wildlife)	Red tree voles must be surveyed. The recent fires in SW Oregon should lead the Forest Service to re-evaluate the decision not to conduct surveys and accept the inadvertent loss of red tree vole nests and are not surveyed. Known red tree vole nests occur near units 79a, 79B, and 78B and must be protected.	As stated in the DEIS (pg. 138), the red tree vole was listed as a Category “D” survey and manage species. Surveys are not required for this species listing. A range-wide annual species review in 2003 (post-fire) removed the red tree vole from the survey and manage species list for the Umpqua National Forest (FS Memo 12/19/03). The DEIS discloses that Unit 79B would not be harvested in any alternative to protect the known red tree vole site in that location (DEIS p. 138). In March of 2004, the Record of Decision was signed to remove survey and manage mitigation measure standards and guidelines from the Northwest Forest Plan. The red tree vole did not meet the criteria for inclusion in the Forest Services “sensitive species” program on the Umpqua National Forest. Regardless, the decision to drop Unit 79B made during the planning phase of this project will be retained.
30	Science	The decision on this project must be deferred until the Forest Service produces credible monitoring results to show that their management is not harming Management Indicator Species: pileated woodpecker, marten, elk, and “cavity nesters.” It is clear that salvage will significantly harm all these species. Why can’t the Forest Service follow requirements to monitor these species and determine whether management is impairing these species? Why do we have to act in ignorance of the consequences of our actions?	The process of monitoring of individual species as “Management Indicator Species” was subsumed by the Northwest Forest Plan, which shifted federal land management agencies from single-species management to ecosystem management. Inclusion of standards and guidelines for providing specified amounts of coarse woody debris in the Matrix land allocation (ROD C-40-42), 100-acre reserves around owl activity centers (ROC C-10) and riparian reserves for intermittent streams (ROD C-30-31) allowed a Species Analysis Team to determine that regional habitat conditions would be sufficient to support stable, well-distributed populations of these species throughout most of their range (FEIS, Appendix J2). The proposed project is consistent with these standards and guidelines.
30	Science (wildlife)	The Forest Service failed to consider new information on pileated woodpeckers that live on the westside of the cascades. They need more and larger roosting trees than nesting trees and these needs are not recognized in current management requirements. Determining pileated woodpecker population potential based on nesting sites is inadequate. The EIS must	The DEIS used information from DecAID to analyze the potential effects of the project and to help determine adequate retention levels of dead wood for wildlife species, such as the pileated woodpecker. DecAID (and the DEIS) incorporates the new information referred to from the following scientific paper - Aubry,

Letter Number	Subject of Concern	Comment	Forest Service Response
		address this new scientific information. See <i>Science Findings</i> Issue 57 (October 2003) Coming home to roost: the pileated woodpecker as ecosystem engineer, by Keith Aubry, and Catherine Raley, http://www.fs.fed.us/pnw/science/scifi57.pdf .	K.B., and C.M. Raley. 2002. Selection of nest and roost trees by pileated woodpeckers in coastal forests of Washington. J. Wildl. Manage. 66(2):392-406, which is listed in the literature list for DecAID.
31	Snag/down wood	On pg. 111 of the DEIS, the Forest Service notes the January 19, 2001 Memorandum of Understanding refinement of the coarse wood requirements. However, nowhere in the discussion does it discuss whether these local models were applied to the various alternatives.	The last paragraph on page 111 and Table 27 disclose how local models were used to determine how much wood to retain to achieve adequate levels in the future. Pages 117-118 provide further discussion on how the local model data is used for various alternatives.
30	Snags/down wood Soils	The fire already removed a significant fraction of on-site nutrients. Salvage logging will only compound the loss. Removing so many large nutrient reservoirs in the form of tree boles will steal from the future forest. The EIS analysis of nutrients is flawed because it fails to recognize that the large quantities of nutrients that are tied up in the boles of trees are not needed now, because there is very little live vegetation ready to take those nutrients, but as the forest grows and develops these nutrients will be needed over time as the dead tree boles are colonized by fungi and slowing release their nutrients to the developing forest.	The DEIS does take into account the nutrient value in the boles proposed for removal (p156). The FEIS discloses the trade-off of long-term site productivity in order to lessen fuel loads and future fire severity. In addition, the numbers of trees retained on site meets the ecological requirements as determined by the Plant Association Group. Future colonization of fungi is expected to occur; inoculation of seedlings with Mycorrhizae will add additional fungi to the site.
30	Snags/down wood	The plan also requires “renewable supply of large down logs well-distributed across the landscape” (p C-40). Since the burned stands are not recruiting many more large trees for a long time, the Forest Service must retain most or all of the existing large snags to provide this renewable supply of down logs.	Pages 111 and 117-118 of the DEIS discuss how snag decay and fall down rates were used to determine how much to leave to meet the standard and Guideline on page C-40 of the Northwest Forest Plan over the next 100 years. The remainder of the discussion on coarse woody debris discuss further, how much of this material will remain on the landscape.
5	Snags/down wood	For Alternative 3, where is the standard for retaining trees greater than 30 inches coming from? How much of the fire area has over 15 trees over 30 inches?	30 inches leave trees is not a forest plan standard, the thirty-inch tree diameter criterion was the result of the equations used (Mellon and Ager 2002) by the IDT to determine future down wood needs. Late seral habitat occupied over 4,200 acres of the planning area affected by the 2002 Apple Fire. Sixty-two stands were sampled; eleven stands had well over 15 trees per acre over 30” diameter. The intent of the tree retention is to retain the largest diameter trees.

Letter Number	Subject of Concern	Comment	Forest Service Response
			Regardless of what is existing on-site, the largest trees would be retained (DEIS page 26).
5	Snags/down wood	For Alternative 4, what sizes of trees will be included for retention of 12 trees/ acre. Is this in addition to the 2 trees/acre that will be felled?	The largest diameter trees available will be retained to meet the 12 tree/acre retention level. This includes the 2 trees/ acre felled for site productivity (DEIS, pg. 33).
28, 29	Snags/down wood	While the analysis focused on snag populations within the planning area, Fig. 41 on page 109 of the DEIS portrays a more accurate view of snag populations. Alternative 4 exceeds Forest Plan snag requirements by roughly 400%. The snag retention planned is excessive and will jeopardize the future survivability of any efforts to reestablish a thriving conifer forest.	The snag retention requirements are based on needs of wildlife species and coarse woody debris. The Silviculturist retained additional trees in order to provide shade for seedlings. Reforestation efforts will not be hampered by snag retention levels.
24	Snags/down wood	Finally as mentioned before we remain concerned about retaining 6-12 snags per acre in the treatment area. When one looks around at all the dead trees in the riparian areas, all of the dead trees in the less intensively burned area, all the dead trees in the Spring Fire and all of the dead trees in the Tiller Complex, most of which is not proposed for salvage, it is unfathomable to think that cavity nesters can't find more than abundant material for foraging or nesting on the Umpqua National Forest within a very short distance from the harvest sites. While snags are valuable for cavity nesters they are also tremendous fire and safety hazards. Somehow these negative attributes must be given serious consideration.	As stated above, the snag retention requirements are based on needs of wildlife species, coarse woody debris, and shade for seedling survival. The effect of snag retention is addressed throughout the DEIS. In terms of fire hazard, snags are discussed throughout pages 70-99. In terms of safety hazards, snags are addressed on pages 286-287.
30	Snags/down wood	This EIS discloses numerous conflicting interests involving removing versus retaining trees. Removing logs reduces fire/fuel hazards, but also reduces wildlife habitat in the short and long-term, reduces survival and growth of planted trees, reduces biomass and diversity of recovering vegetation, delays vegetation recovery, decreases soil moisture, removes sediment traps, deprives streams of LWD, and all the other ecological functions described in Rose et al 2001. While retaining large logs cause some potential fire/fuel hazard, but serves all the functions described above. Please make sure that the ROD clearly documents and explains all the tradeoffs and the explicit rationale for the final decision.	The DEIS does disclose both the positive and negative impacts of removing dead trees through salvage logging throughout Chapter 3.

Letter Number	Subject of Concern	Comment	Forest Service Response
5	Snags/down wood	Does the standard of leaving 2 felled trees/acre apply to all areas? Are there areas that already have adequate amounts of down wood?	The felling of two snags/acre would occur only within the salvage harvest units (DEIS pages 20, 26, 33, 40, 45, and 53). The snags to be felled would come from the leave trees after the sale is logged and the actual felling would be funded by KV.
30, 35	Snags/down wood	The current snag retention requirements of the Umpqua LRMP and even the Northwest Forest Plan are not up-to-date. The EIS uses DecAID to analyze down wood requirements but not for snag-dependant species. Since DecAID is the best available science, the Forest Service must use it. NOTE on DecAID: Be sure to use this tool appropriately. The commenter states that the use of DecAid and its results are good for cavity nesters and birds. Numbers for snag retention are “even better now with DecAid”.	DecAID was used for this project (pages 116-119). DecAID does include information and advice on snag retention and snag-dependent species. DecAID was used in an appropriate manner.
30	Snags/down wood	The EIS analysis of ACSO #9 (p 102) is inaccurate because it fails to adequately provide for coho, steelhead, cutthroat, marten, bats, cavity nesting birds, and: a. It fails to retain enough snags and down wood to support abundant prey species for spotted owls. b. The DEIS fails to consider snag fall rates and the severely limited snag recruitment rates. After a portion of the few snags that are retained fall down the salvaged areas will fall far short of species requirements. c. The EIS admits that private lands are not doing enough to maintain viable populations (p 109) so federal lands must do more (much more).	No trees of any size will be cut from within the immediate flood plain or 75 feet (which ever is greater) of fish bearing streams. No trees will be removed from the riparian from within one site potential tree of any stream channel (DEIS pg. 31). Moreover, all recognizable unstable areas that could deliver dead trees to riparian areas have been removed from all action alternatives. Therefore, there will be no appreciable effect to LWM recruitment to stream channels. The determination of effects for coho under all alternatives has been determined to be May impact individuals, but not likely to cause a trend toward Federal listing. Prior to the February 2003 court order which resulted in the temporary removal of regulatory authority of NOAA Fisheries regarding Oregon Coast coho, the fisheries Level 1 consultation team had concurred with the Not Likely to Adversely Affect effects determination for coho salmon for Alternative 6. A – The DEIS discusses the indirect effects to the spotted owl from impacts to prey habitat (pages 123-124). This impact is not considered adverse due to the analyses that show how snag and down wood levels will be maintained at or above required levels based on

Letter Number	Subject of Concern	Comment	Forest Service Response
			Forest Plan standards and guidelines and DecAID advice (pages 110-119). B – The DEIS discusses how snag fall rates and decay rates were incorporated into the cumulative effects analysis on page 117. Cumulative levels of dead wood (snags and logs) were modeled out over 100 years. C – The preferred alternative for the FEIS (Alternative 6) salvages about 15% of the burned Matrix land outside of riparian reserves and unsuitables. Within the entire fire area, Alternative 6 salvages about 5% of the fire area, leaving snags and coarse wood distributed across the landscape.
30	Snags/down wood	The DEIS fails to consider snag fall rates and the severely limited snag recruitment rates. After a portion of the few snags that are retained fall down the salvaged areas will be in clear violation of forest plan snag requirements.	DEIS Pages 111 and 117-118 discuss how snag decay and fall down rates were used to determine how much to leave to meet Northwest Forest Plan standards on page C-40 over the next 100 years. By following the landscape plan and timber harvesting recommendations in the watershed analysis (USDA 2001), and the Forest Plan Standards and Guidelines, the action alternatives would allow the forest within the planning area to move towards a desired range of landscape patterns and stand structures, which approximate the natural disturbance regime. Once attained, the planning area would provide the appropriate amounts of habitats to support well-distributed populations of riparian dependant species.
30	Snags/down wood	The EIS refers to the SW Oregon PIEC 1-19-01 MOU on Coarse Wood but fails to recognize that this document is for green stands and assumes relatively continuous recruitment of coarse wood from within and adjacent stands, i.e., it does not apply to post-fire situations where recruitment is severely limited.	The MOU applies to coarse wood requirements for <u>regeneration harvests</u> within the Matrix. It does not specify whether the harvest is of green or dead trees. DEIS pages 111 and 117-118 discuss how snag decay and fall down rates were used to determine how much to leave to meet Northwest Forest Plan standards on ROD p. C-40 over the next 100 years.

Letter Number	Subject of Concern	Comment	Forest Service Response
30	Snags/down wood	The down wood retention is also inadequate and the DEIS failed to account for very limited recruitment of down woody debris, decay, and the fact that much of the down wood that is retained will burn up in slash fires. This means that future down woody debris levels under the preferred alternative will likely violate LRMP requirements.	Pages 111 and 117-118 discuss how snag decay and fall down rates were used to determine how much to leave to meet ROD C-40 over the next 100 years.
30	Snags/down wood	Alternative 3 meets a DFC of 2 snags per acre and 504 feet of down woody debris in 100 years. Where does this come from? Is this from the forest plan? If so, most of the other alternatives will violate the forest plan by retaining far too few snags to meet the long-term DFC.	These numbers come from the use of plant association group forest plot inventory data and a model that considers decay and fall down rates of dead trees. Pages 111 and 117-118 discuss how snag decay and fall down rates were used to determine how much to leave to meet ROD C-40 over the next 100 years.
32	Snags/down wood	The FS has failed to meet its legal obligation to maintain viable populations of cavity excavators, including pileated and northern three-toed woodpeckers. There are no surveys for these species, there is insufficient suitable habitat within the planning area (and what habitat does exist will be drastically reduced if logging takes place), and the habitat model selected by the Forest Service is unsuitable for the proposed project.	The Forest Service is meeting its legal obligation to maintain viable populations of cavity nesters by meeting or exceeding the standards and guidelines in the Northwest Forest Plan. Inclusion of standards and guidelines for providing specified amounts of coarse woody debris in the Matrix land allocation (ROD C-40-42) allowed a Species Analysis Team to determine that regional habitat conditions would be sufficient to support stable, well-distributed populations of these species throughout most of their range (FEIS, Appendix J2). The northern three-toed woodpecker does not occur on this forest.
30	Snags/down wood	Protect all large snags. If the agency chooses to conduct a salvage operation in this fire area, they must use a diameter cap and protect these scarce and valuable structures. The agency's snag retention guidelines are based on wildlife needs, but fail to consider or analyze the need of large snags and large down logs for shade, water storage, disturbance (via falling and sliding), nutrient storage, channel forming, sediment trapping, soil conservation, underground processes, etc. The NEPA analysis failed to disclose and analyze these significant issues.	Under all alternatives, the largest sized snags would be retained as prescribed. Alternative 3 retains all snags over 30 inches in diameter to address this concern (DEIS page 24). The role of snags and down wood was thoroughly described by resource area within Chapter 3 of the DEIS.
30	Snags/down wood	Provide for well distributed snags. Snag retention should be both clumped and well-distributed, not all clumped.	The retention of snags is prescribed on a per acre basis, in order to distribute them across the landscape. The silviculture prescription, DEIS Appendix D, page 8, describes that snags will be left in both aggregates and as dispersed trees.

Letter Number	Subject of Concern	Comment	Forest Service Response
32	Soils	After asserting that the preferred alternative will not increase the risk of landslides, the DEIS states that ten acres that are proposed to be logged as part of preferred alternative are at risk of instability (DEIS, p. 209). Logging on unstable slopes risks sediment delivery to streams and violates the ACS.	Pages 208-209 of the DEIS thoroughly document that the removal of the dead trees on the 10 acres of land at risk for instability would not increase the likelihood of causing mass wasting. Dead trees do not provide any root strength. Alternative 6, the preferred alternative in the FEIS, salvages on very small inclusions of potentially unstable land totaling about 6 acres based on a digital terrain model. However field reconnaissance revealed no visible areas of slope instability associated with these 6 acres, but slope stability problem areas are not always discernable. The potential impacts of landslides lacking dead wood due to salvage of dead wood that might otherwise be delivered to streams or riparian areas is very slight. The impacts of such a possible occurrence would be slight as well and would not appreciably affect the LWD recruitment or delivery process at the scale of either the 5 th , 6 th , or 7 th field watersheds. This is because the scale of such a potential impact is so small. Since all dead trees will be left along all riparian areas, the potential for new wood recruitment in the planning area's streams is essentially unaffected.
5	Soils	Acres potentially left with <85% ground cover is untrue for the No Action alternative because future fires were not considered.	The number displayed on Table S-3 shows the predicted acres that would have less than 85% effective ground cover immediately after project implementation. Future fires were considered for each Alternative and is analyzed for the No Action Alternative in Chapter 3 of the DEIS (pg. 81-83). Future fires were predicted 25 years in the future, not for the 5 years it would take to implement this project. Should a future fire occur, it is assumed that the area affected by the fire would have less than 85% effective ground cover immediately following the fire.
9, 12, 14	Soils	Unsuitable soils should not be logged even if the trees have burned. The economic incentive for logging harsh soils was removed in 1990 when the Forest Plan forbade logging there. It is unconscionable to allow salvage logging now when it would deter trees from ever growing back. Economic incentives are not worth permanent deforestation.	Alternatives 4 and 6 include salvaging on unsuitable soils (DEIS, pg. 58) in the DEIS. Alternatives 2, 3, and 5, as well as the No Action Alternatives do not salvage trees on unsuitable soils. In the FEIS, salvage on the unsuitable soils units will not occur, as described previously.

Letter Number	Subject of Concern	Comment	Forest Service Response
13	Soils	Salvage logging on 160 acres that contain unsuitable soils under Alternative 4 appears to be a poor idea if the restoration of these areas is a priority. After observing the planting of thousands of acres of the Umpqua National Forest, many of those involved replanting areas that were previously planted and failed. The organic matter created by leaving the affected trees in unsuitable soil areas will provide a much more needed benefit in the long run than the short term benefit solution that logging this 160 acres would provide.	Salvage on unsuitable soils units have been dropped from Alternatives 4 and 6 in the FEIS.
27	Soils	Several places in the DEIS and appendices, the Forest Service says that the unsuitable soils units will retain 12 trees per acre to mitigate for the impacts of logging. ⁷² But that's not what the Alternative 4 table 3 shows. It shows most TRR and TRG units to retain only 6 TPA. The only exceptions are the units that can be seen from Highway 138. This inconsistency in the EIS documentation must be corrected. The public still does not know how many trees per acre will be left in units with unsuitable soils.	These are errors in the DEIS, specifically, Table 3 on pages 36 and 37, plus other locations in the text. Since unsuitable soils units have been dropped from consideration, this has been corrected in the FEIS.
27	Soils	The DEIS is unclear if logging on unsuitable soils will also include areas that would sustain "Irreversible Soil Damage." Figure 55, page 152 in the DEIS, shows areas of unsuitable soils where "Irreversible Soil Damage" could occur, including parts of unit 48A-TRR proposed for logging under alternative 4. But in Table 34 (page 151 of the DEIS), it says that 0 acres of unsuitable soils with "irreversible soil damage" will be logged. Either table 34 is wrong, or Figure 55 is wrong. Which is it?	Logging will not occur on lands classified at risk for "Irreversible Soil Damage" and identified in the Figure 55 map (DEIS, p. 152). Table 34 has been corrected to read "none" for green and salvage sale activities on <u>both</u> Irreversible Soil Damage and Poor Regeneration lands (with respect to TRG and TRR designations only). In the FEIS, all action alternatives were modified to remove <u>portions</u> of proposed units that contain Irreversible Soil Damage lands shown in Figure 55 (All alternatives will drop all unsuitable soils units and units 4720-005 and 48 will be corrected).
.	Soils	The DEIS fails to disclose all the "unsuitable soils" areas that will be logged. The Umpqua National Forest LRMP map of "Unsuitable (Commercial Forest) Land" shows areas that are "unable to regenerate in 5 years" in orange. This map marks as orange over what are unit 48B, 59C, and 59B. The Baked Apple DEIS never explained why DEIS units are mapped different from the LRMP map of unsuitable lands. Unit 42_TRR (between spurs 400 and 390) is mapped in the	Figure 55 (DEIS, p. 152) discloses the location of "unsuitable soils" areas consistent with the criteria used for classifying unsuited lands (LRMP, FEIS Appendix B-8 to B-13). The discrepancy between "orange" areas (LRMP unsuited lands map units) that overlap units 48B, 59C and 59C represent differences between unsuited land mapping done for the 1990 LRMP and the mapping done by District Resource specialists with the assistance of a Soil Scientist (Figure 55,) using project

⁷² For instance, see DEIS page 30, or see Hydrologist Report dated 9/25/03 in the appendices. Page 3. "Areas that were considered difficult to reforest... would retain 12 trees per acre..."

Letter Number	Subject of Concern	Comment	Forest Service Response
		DEIS as unsuitable soils that will endure ground based logging. Tractor logging on unsuitable soils adds insult to injury. The LRMP, page IV-44, says that the Forest Service needs to follow clear steps to change the LRMP unsuitable lands map. This includes documentation of boundary adjustments “in the project records”. We could find no documentation in the Baked Apple DEIS project records for this change from the LRMP.	reconnaissance and other field experiences to improve the Forest Unsuitable Lands map layer. All action alternatives will be modified to remove Unit 42_TRR, in addition to any other unsuitable soil unit. Figure 55 (DEIS, p. 152) discloses the location of “unsuitable soils” areas that will be used to modify the LRMP unsuitable lands map delineations in the same vicinity. The DEIS (Unsuitable Soils, p. 151, paragraph 3) discloses the intent to use Figure 55 to update the Forest database of unsuitable soils. In addition, all unsuitable soils salvage units have been dropped from consideration.
27, 30	Soils	Unsuitable soils have been removed from timber base and cannot be logged, except in some instances for salvage. We question whether the LRMP allows the salvage loophole Baked Apple is using. The Baked Apple DEIS says that “given the situation of wildland fire in the project area, an exception to enter unsuitable lands is allowed for “removal of timber killed by catastrophic events.” But the Apple Fire was not a “catastrophic event”. Don Morrison said at several public meetings that the Umpqua 2002 fires are well within the realm of a “natural”, not catastrophic event. Additionally, the LRMP salvage exception for logging on unsuitable soils says that the Forest Service must consider “economic, social and environmental consequences, with emphasis placed on coordination to meet other resource needs.” These consequences were not adequately considered in the DEIS, and the emphasis was not placed on coordination to meet other resource needs. The DEIS spent virtually no time on the environmental impacts of logging on unsuitable soils. The only conclusion the DEIS reached was that permanent deforestation would be good for wildlife species who like early seral habitat, as if there wasn’t enough of that around. Salvage logging on unsuitable soils is inappropriate in part because salvage logging will set back vegetation recovery that may already be tenuous. The LRMP IV-44 allows for salvage on these sites under certain circumstances and considerations which the FS has not done.	The Apple Fire was a catastrophic event as defined by the LRMP, which states: Exceptions for maximum opening sizes of 40-60 acres are permitted for catastrophic events (such as fires, windstorms or insect and disease attacks) (LRMP IV-43). Salvage in riparian areas is restricted to catastrophic occurrences (>50% of existing stand). This wording is repeated in other management prescriptions applied to stands adjacent to perennial and/or fish bearing streams (C2-I, -IV, -VII, -VIII and -IX) (LRMP, IV-170). The LRMP defines “catastrophe” for small time and space scales. In the context of centuries and landscapes, the 2002 fire may not be considered catastrophic (within the realm of a “natural” event). The Middle North Umpqua watershed experienced high intensity stand replacement fires (several thousand acres in size) over a short time frame of 30 to 80 years beginning in the late 1800’s (DEIS-65 and Middle North Umpqua Watershed Analysis-Figure 11, page 26). The DEIS does not conclude that “permanent

Letter Number	Subject of Concern	Comment	Forest Service Response
		The FS has not fully described the environmental consequences including long term productivity, increased erosion and sedimentation, delayed big game cover, delayed recruitment of large wood to the terrestrial and aquatic systems, long term soil productivity, water quality, big game cover (LRMP IV-132) and snag and down wood function.	deforestation would be good for wildlife species who like early seral habitat”. Instead, page 153 of the DEIS states that there could potentially be a long-term occupation of shrub or grass species in these areas, having a beneficial effect on some wildlife species. Proposed salvage <u>will</u> increase the period of time needed for initial vegetation recovery (as disclosed on DEIS page 224), particularly were post-harvest fuel treatments are implemented, a tradeoff to fuel reduction and lower fire risk in the future. However the salvage and its associated reforestation will accelerate succession in the long-run. The reforestation, which is paid for by KV trust funds, collected from the salvage sale proceeds, will help accelerate soil root strength, not delay it. The roots of trees stave off landslides not the roots of initial pioneering vegetation such as moss, grass, and shrubs. The few live trees felled or damaged by the logging would have no bearing on root strength since landslides only increase when several trees within a stand die. The contribution of root strength from individual scattered trees that may be injured or felled is inconsequential. Salvage on unsuitable soils units has been dropped under Alternatives 4 and 6, as described previously.
27, 30	Soils	The Umpqua National Forest has no ecological reason to log on unsuitable soils. The WEEP report says: “management practices that remove organic matter from low-resilience sites after a wildfire, or prevent the input of nitrogen into the soil, may aggravate the severity of fire effects on the long term soil productivity.” Even the DEIS admits that salvage logging here could cause permanent deforestation (DEIS page 152). Salvage logging on unsuitable soils is inappropriate in part because salvage logging will set back vegetation recovery that may already be tenuous. The LRMP IV-44 allows for salvage on these sites under certain circumstances and considerations which the FS has not done.	Proposed salvage logging operations will <u>not</u> significantly increase the risk of mass wasting over and above what the fire is expected to cause (DEIS, p. 208). A slope stability model, SHALSTAB, was used to assess risk of mass wasting in the vicinity of proposed salvage units and to identify the areas that were visited to assess mass wasting risk on the ground. The results of this model were also used to assess risk by alternative of proposed salvage (DEIS, p. 209, Table 53). Proposed Salvage <u>will</u> increase the period of time needed for vegetation recovery, particularly were post-

Letter Number	Subject of Concern	Comment	Forest Service Response
		The FS has not fully described the environmental consequences including long term productivity, increased erosion and sedimentation, delayed big game cover, delayed recruitment of large wood to the terrestrial and aquatic systems, long term soil productivity, water quality, big game cover (LRMP IV-132) and snag and down wood function. Document that the likelihood of mass wasting will not increase. Logging will damage and kill some live trees and other vegetation that currently provide soil cohesion. Salvage will delay the recovery of the next generation of vegetation that must grow and replace the decayed roots the burned vegetation. LRMP IV-203 C5-V, drop the 159 acres of harvest on unsuitable soils.	harvest fuel treatments are implemented, a tradeoff to fuel reduction and lower fire risk in the future. Page 152 of the DEIS states that salvage on unsuitable soil units “could potentially lead to long-term occupation of shrub or grass species”, not permanent deforestation. More analysis and disclosure was added to the FEIS related to site productivity impacts. The DEIS describes the environmental consequences in terms of Erosion Risk (DEIS, p. 149), Surface Erosion (DEIS, pp. 219-238), Fluvial Erosion and Large Woody Material in streams (DEIS, pp. 110-119) as well as the consequences to Soil Productivity (DEIS, Pp. 153-159), terrestrial Coarse Woody Debris (DEIS, pp. 110-119), Big Game Cover, DEIS, pp. 136-7) and Water Quality (DEIS, Aquatic Environmental Effects, pp. 177-266). See previous discussion of mass wasting risk above. Alternatives 4 and 6 have been modified to eliminate the salvage on unsuitable soils units.
27	Soils	More specific “unsuitable soil” unit concerns: Unit 42_TRR (between spurs 400 and 390) is mapped in the DEIS as unsuitable soils that will endure ground based logging. Tractor logging on unsuitable soils adds insult to injury. And unit 42_TRR is mostly green trees. There is little evidence the fire even burned here. The DEIS alternative 4 designates this unit as leaving only 6 trees per acre instead of partial harvest (or at least 12 TPA). This unit must be dropped from the proposal. Since this unit is not in the timber base and it can only be logged if there is a catastrophic event. There is no such event, especially in this green unit. Tractor logging here will ruin this place. Unit 78F_TRR is very rocky and appeared unstable. We have special concerns over this unsuitable-soil-unit because it borders riparian reserves for its entire east and south boundaries. Unit 78B_TRR is also a concern because of its proximity to riparian reserves and the fact it will be skyline harvested, dragging one	All unsuitable soils units have been dropped from both Alternatives 4 and in the FEIS, as discussed previously.

Letter Number	Subject of Concern	Comment	Forest Service Response
		end of the logs up the steep slopes.	
30	Soils	The EIS (p 155) claims that soil cover will be “maintained and enhanced” by logging. The EIS (p 156) also claims that the heavy logging alternatives will have “direct beneficial effect of reducing the risk of surface erosion.” This analysis is seriously flawed and fails to account for several important facts: a. Pages 219 and 221 states clearly that surface erosion “drops off dramatically” as ground vegetation re-establishes. b. The EIS also admits that logging will set back vegetative recovery (EIS page 173) (Sexton 1998). Both live leaf cover and live roots are important to soil conservation but will be significantly decreased due to logging disturbance. c. Logging will disturb existing cover in the form of needles and small branches that are already littering the forest floor. d. Logging will gouge the soil and break small roots that may be dead but are still holding the soil. e. The Forest Service has not included burned soil areas in its accounting of detrimental soil conditions as required by the LRMP. The Apple fire burned many acres at high severity and slash burning will burn many more acres. These burned acres must be added to roads, skid trails, yarding corridors to make final determinations of compliance with DSCs. Each harvest units must be field verified and disclosed in the EIS. P 154. f. Slash piling and burning will cause serious soil impacts and lead to erosion. g. The EIS says that erosion “can occur” in yarding corridors, but fails to admit that any such thing will happen in this steep, severely burned landscape. How can this be? h. Page 263 indicates that tree boles help retain dislodged soil. Too many tree boles are removed through salvage logging to fulfill this critical function.	The analysis does consider soil cover and the contribution of logging slash. A: While ground vegetation does slow erosion, effective ground cover in the form of logging slash would also slow surface erosion. B: The EIS states vegetative recovery “would be stalled for two to three years following activities”. Live leaf material is important to the soil, especially when this green organic mater will add to the soil. Live leaf cover will be replaced with slash during the period of delayed vegetative recovery. C: This is recognized in the DEIS. However there will be more material added in a shorter span of time because of the creation of activity generated slash. Additionally, some of the disturbed material will be mixed in at the surface to speed decomposition, with another portion lost to fuels treatments as disclosed in the DEIS (page 153). D: Logging is expected to gouge the soil along some skyline corridors; breakage of fine roots will happen. For this reason the DEIS mitigates this practice with contract provisions requiring the treatment of soil gouges where applicable and the provision of effective ground cover. These measures will put more organic matter in contact with the soil and speed the recovery of fungi and other potentially beneficial soil organisms. E: Burned soils areas were taken into account when calculating detrimental soil conditions for the DEIS. The detrimental soils analysis was recalculated in the FEIS using more site specific information. F: While machine slash piling and burning can cause localized soil impacts, this has not been the case found for hand-piling operations. Moreover, this is a localized occurrence and depending upon the size of the pile and its duration of heating, these effects may not be seen.

Letter Number	Subject of Concern	Comment	Forest Service Response
			G: The DEIS states that erosion “can occur” in yarding corridors (page 225). Page 153 states that the 2002 Apple Fire elevated erosion rates for the area of the burn. H: All tree boles will be retained in all riparian reserves and at least 4 trees per acre within the salvage units to meet Forest plan standards and guidelines.
30	Soils	The Forest Service must also minimize soil and litter disturbance caused by logging and yarding (p C-44). Best Management Practices are not enough. This is critically important in a salvage situation where the soils are already directly impacted by fire. Ground-based logging must be prohibited because the fire consumed litter, volatilized soil organics, killed beneficial soil organisms, roots of surviving trees can be more easily damaged by ground-based logging, and loss of soil cover means erosion is more likely. Dragging logs during skyline yarding must also be prohibited. The DEIS eliminated analysis of an alternative that would follow Beschta recommendations by using helicopter only, but this alternative is required by the Northwest Forest Plan soil standards.	The use of helicopters to grapple log a Beschta prescription was thoroughly analyzed and determined to be economically infeasible, and ultimately dismissed. The grapple helicopter logging alternative was developed rather than regular, relatively less expensive helicopter logging, which would require ground crews to set chokers under the rotor wash of helicopters equating to a high level of risk to worker safety. The Beschta Report does not recommend helicopter logging as the sole method of harvest. All soils standards and guidelines were followed in the development of alternatives.
30	Soils	Units 16, 27A, 27B, 38, 70, 71, 86, and 90 have high erosion and landslide risk and must be deferred in order to meet the ACS.	These units mentioned likely will have some accelerated erosion during activity; however, the effective ground cover left after harvest and site preparation will help mitigate the erosion.
30	Soils Fire/Fuels	Why did the Forest Service model vegetation regrowth as part of the soil cover analysis (p 153) but not as part of the fire and fuels analysis (p 70)? a. The Forest Service implied it was too widely variable for the fuel analysis but why is it OK for the soil cover analysis. b. How is the “widely variable” aspect of vegetation regrowth accounted for in the soil cover analysis?	The FARSITE model does not take into account the widely variable factor of shrub regrowth. “The modeling does not include projected shrub and tree growth as these conditions could vary widely from area to area and depend on whether action is taken to replant areas or manipulate shrubs. Shrub growth is likely to be the same under all alternatives. Shrub growth within the first 5 years would tend to slightly dampen the predicted fire indices (flame length, rate of spread, and fireline intensity) due to considerably higher fuel moistures than similar size dead fuels. This damping effect would tend to increase as shrub growth increases for approximately 20 to 40 years until shrub decadence and the higher fuel moistures in the live portions of the shrubs reaches

Letter Number	Subject of Concern	Comment	Forest Service Response
			some equilibrium. After that point the damping effect subsides as the shrubs become more available as part of the overall fuel bed” (page 11 of Specialist Report). The WEPP model used for surface erosion analysis accounts for the amount of effective ground cover in the form of live vegetation, surface organic layers, including logging created slash and other surface materials such as rock that all shield soil surfaces from erosion.
30	Soils	The WEPP model used by the Forest Service may not be calibrated to accurately describe erosion from logging steep slopes after fire.	The WEPP model is designed to predict runoff and sediment yield from wildfire on steep slopes. The WEPP model was able to predict sediment delivery in a wet, steep Cascade scenario (Elliot, W.J.; Robichaud, P.R. 2001. Comparing Erosion Risks from Forest Operations to Wildfire. <i>In</i> : Peter Schiess and Finn Krogstad, editors, Proceedings of The International Mountain Logging and 11th Pacific Northwest Skyline Symposium: 2001 - A Forest Engineering Odyssey. Seattle, WA: College of Forest Resources, University of Washington and International Union of Forestry Research Organizations. 78-89. Presented at The International Mountain Logging and 11th Pacific Northwest Skyline Symposium 2001, December 10--12, 2001, Seattle, WA.)
30	Soils	The EIS (p 223) appears to rely on the buffers ability of riparian areas that burned and lost their ground cover and with it much of their ability to trap and filter sediment.	Riparian buffers that were burned were modeled as having reduced cover yet little (Alternative 4) to no treatment (all the other alternatives) would occur in riparian reserves. Their vegetative recovery would occur uninterrupted by salvage logging and subsequent slash burning allowing succession of the pioneering species (moss, grass, forbs) to proceed uninterrupted.
30	Soils	The EIS analysis of short term use and long term productivity must disclose the fact that salvage logging will remove nutrients and other soil-supporting values of values of large logs. Alternative 2, 4 and 6 are completely unacceptable salvage proposals because they leave too few trees behind to help replenish the fragile, burned soils. Alternative 4 and 6 even logs on unsuitable soils and in riparian reserves.	The Baked Apple DEIS discloses that under the action alternatives, there would be reduced soil nutrients (DEIS p. 159). More was added to this analysis in Chapter 3 of the FEIS. The DEIS also used LWD monitoring (associated with Wildlife Section) to determine the quantities of logs present in unburned environments to determine the amount of logs to leave for each alternative and the

Letter Number	Subject of Concern	Comment	Forest Service Response
			needs of the soil resource. Logging on unsuitable soils units was eliminated from both Alternatives 4 and 6 as described previously.
30	Soils	Unsuitable soils should not be logged even if the trees have burned. The economic incentive for logging harsh soils was removed in 1990 when the Forest Plan forbid logging here. It is unconscionable to allow salvage logging now when it would deter trees from ever growing back. Economic incentives are not worth permanent deforestation.	Unsuitable soils units were eliminated from logging under both Alternatives 4 and 6.
30	Soils	Protect forests as carbon.	Land will not be converted from forest to nonforested use in this proposal; thereby the short flux in carbon storage will not affect the amount of carbon stored (Bouwman and Leemans 1995. <i>The Role of Forest Soils in the Global Carbon Cycle</i> . Printed in Carbon Forms and Functions in Forest Soils. Mcfee and Kelly Editors. Copyright, Soil Science Society of America) The assumption by these authors was that deforestation would fail to protect soil as carbon, not forest management activities.
1, 2, 3	Soils/Water quality	Salvage logging will create erosion and result in sediment loading impacts to salmon, cutthroat trout, and steelhead populations.	Water quality best management practices such as leaving slash to maintain effective ground cover, and use of other erosion control measures will be implemented in harvest units to mitigate activity-related surface erosion (DEIS, pg. 48-49). The project, as mitigated, is expected to have a very low likelihood of causing an effect on essential fish habitat, the species considered, and their major freshwater prey species (DEIS, pg. 265). Impacts to the sensitive coho salmon is projected to be limited in extent and duration and was given a “May Affect but Not Likely to Affect” determination when the species was listed as threatened (DEIS, pg. 265). NOAA Fisheries the level 1 consultation team concurred with that effects call prior to the shift of coho to sensitive species status that occurred between the Draft and the Final EIS

Letter Number	Subject of Concern	Comment	Forest Service Response
35	Soils/Water Quality	The total area impacted raises an important issue. If the salvage results in sedimentation or soil compaction, then the more area impacted the bigger the problem. If the salvage can avoid those kinds of impacts (also the spread of weeds), then salvaging larger areas with less [trees] removed per acre is better than a smaller area with more [trees] removed.	The alternatives are all designed to minimize impacts to soils. Mitigation measures are prescribed in order to reduce the potential for noxious weed spread. Alternative 6, the preferred alternative in the FEIS, retains between 4-15 trees per acre on most salvage units, and retains from 25-175 trees per acre on units that receive a Beschta-type prescription.
27, 30	Soils/Wildlife	Leaving mostly 6 trees per acre in Alternatives 2 and 4, and only 4 trees per acre in places with Alternative 6 is not leaving an adequate number of standing trees for wildlife, or dead trees for soil nutrients, especially in the upper parts of the slopes. Trees left further down the slopes, such as in Riparian Reserves, cannot contribute to soil nutrients uphill. The DEIS erroneously averages the effects of the dead retention trees over all harvest acres. This analysis neglects to look at the effect to the ridgetops, which will be more heavily salvaged than riparian areas. A new DEIS must correct this error.	All alternatives retain coarse woody debris in amounts that meet or exceed forest plan requirements. Page 159 of the DEIS documents the effect of the 2002 Apple Fire on nutrients, and the subsequent effect of salvage and slash treatment on soil nutrients. Additional analysis and effects disclosure regarding nutrients was added to the FEIS.
32	Visuals	Logging Unit 44 is located in a middle ground retention LRMP land allocation. Logging this unit and possibly other units, likely violates Umpqua Land and Resource Management Plans standards and guidelines for managing visual resources.	Unit 44 is mapped as visual quality middle ground retention sensitivity level one. By retaining 70% of the trees in all alternatives the required retention VQO will be met. Management activities would not be evident and there would be no direct, indirect or cumulative effects to the VQO (DEIS p. 277).
30	Water Quality	The EIS indicates that logging related sediment increases will be minimized but this is not enough to meet the ACS. We need an honest assessment of ACS consistency, not unsupported conclusions.	None of the Baked Apple alternatives would affect the sediment regime associated with the surface erosion process at the scale of the 5th field watershed over the time-frame of decades or longer. The various action alternatives would cause short-term adverse effects on the surface erosion process due to disturbance of recovering post-fire vegetation from logging and slash burning, yet this impact is not expected to last any longer than a few years. The salvage activities, including slash burning, is not expected to cause any appreciable change to the sediment regime from surface erosion over the long-term since vegetative recovery in the form of pioneering ground cover (moss, grasses, herbaceous vegetation and sprouting hardwoods) recovers quickly to hold surface soils in place. In addition, there will be at least 85% Effective

Letter Number	Subject of Concern	Comment	Forest Service Response
			Ground Cover after salvage and site preparation to help mitigate surface erosion.
30	Water Quality	The watershed analysis page 46 cites Stillwater 2000 to show that timber harvest and roads have increased sediment in the watershed by 3 times. This project is just more logging and more roads, and in a watershed that is steep and has extremely erosive soils. The Forest Service cannot reconcile this increased in erosion and sedimentation with the Clean Water Act and the Aquatic Conservation Strategy.	The erosion hazard was reanalyzed in the FEIS showing more erosion hazard than disclosed in the DEIS. The DEIS discloses that in addition to the natural processes that result in sedimentation (surface erosion, mass wasting, and fluvial erosion) following fire, road-related sedimentation from the existing road network and sedimentation related to logging, including log haul on roads, can be expected (DEIS p. 201). Management related erosion (from existing roads, timber harvest and road maintenance associated with salvage activities) would be controlled or mitigated in order to meet the requirements of the Clean Water Act, and to be consistent with the Standard and Guidelines in the Umpqua Forest Plan including those in the Northwest Forest Plan. Though short-term impacts from erosion and sedimentation are expected within the 6th field watershed of Panther Creek, long-term impacts lasting more than a decade will not be realized at the scale of the Middle North Umpqua 5th field watershed. Alternative 6 which was selected by the Responsible Official was designed to contribute to the maintenance and restoration of landscape patterns based on the watershed analysis, and it meets all standards and guidelines in the Forest Plan, as amended by the Northwest Forest Plan. Mass wasting risk was evaluated using the SHALSTAB model (DEIS p. 206). All unstable areas mapped by as 'at maximum risk' of instability and subsequently field verified during the intensive field investigations were removed from all alternatives. Increased levels of effective ground cover generated and retained with the harvest and site preparation would reduce surface erosion. While management related activities will likely expose some areas of soil to surface erosion from

Letter Number	Subject of Concern	Comment	Forest Service Response
			rainfall, surface erosion and associated sedimentation are anticipated to be short-term and localized. By the fall of 2004 when logging could begin, riparian buffers will have recovered substantial herbaceous vegetation along with hardwood sprouting to function as ground cover to help arrest the gravity and rain driven movement of surface erosion before it enters streams.
30	Water Quality	The EIS (pp 259, 260) includes two inaccurate checklists of aquatic indicators. Based on these comments the preferred alternative deserves degrade marks for: sediment and turbidity, large woody material, pool character, stream bank condition (related to peak flows), changes in base/peak flows, disturbance history, and landslide rates (or more accurately, landslide “quality” and LWD recruitment to streams). The site scale must also be considered. Fish (and their eggs) live and die at very specific sites.	These tables and the base line ratings which they depict are generated from numerous sources and are dynamic in nature. The scale at which they are developed are the 5 th and 6 th field watershed scales. The scale that is more likely to readily change due to episodic shifts in the environmental baseline would be the smaller 6 th field scale. The baseline for each relevant indicator was determined using data sets, information, surveys, documents, and professional judgment as listed in the table legend. These baseline rating determinations are also interdisciplinary in nature. The scale used for these tables is consistent with direction formulated in cooperation with NOAA Fisheries.
30	Water Quality	The project is located in the transient snow zone and will not remove much green canopy, but salvage logging will still adversely affect peak flows. Abundant snags and logs help trap snow on the hill slope with the effect of encouraging infiltration and slowing water run-off during big storm events (p 218 citing Lancaster et al. 2001). Salvage will degrade this function and effectively increase water peak flows. The EIS analysis of peak flow does not consider this.	Accumulations of snow are expected due to the reduction of live canopy because of the fire. The hydrologist for the project has not found literature to support that down wood increases snow accumulation, although it does seem intuitive that it may stay longer in some of these areas due to shading. However, it is the accumulation of snow when exposed to rain that creates rain-on-snow events that can dramatically increase peak flow events. The logs and snags may potentially exacerbate the situation, not decrease the risk of peak flows. In addition, overland flow is extremely rare on these soils. Peak flows are driven by saturated soil conditions not overland flow in this terrain. Down wood and dead snags on hillslopes would do nothing to reduce subsurface soil saturation.
30	Water Quality	When conducting activities that could impact 303(d) listed streams, the land management agencies have agreed to validate impairment of listed streams, demonstrate that measures are in place to prevent further degradation, and	The only listing within the planning area is for temperature. Detailed analysis within the DEIS clearly demonstrates that stream temperatures will not be affected by the proposed salvage related activities.

Letter Number	Subject of Concern	Comment	Forest Service Response
		develop water quality restoration plans before TMDL are developed. The agency has not fulfilled its obligations under this interagency agreement.	The protocol developed by DEQ is guidance that allows for flexibility in approach. Currently, the Forest meets the intent of the protocol, primarily through the MOA that the Forest Service has with DEQ, but also because: 1) the Forest validates data by participating in the state's call for data; 2) the Forest has protection and restoration measures in place via the ACS, BMPs, etc.; 3) the elements of a WQRP are analyzed in the DEIS and in existing watershed analyses.
30	Water Quality	The EPA erred in exempting timber harvesting from the requirement of obtaining a stormwater runoff permit under the Clean Water Act. The agency should obtain a NPDES permit. The EPA put the Forest Service and BLM on notice of this new permit during an IAC meeting November 5 th , 2003.	The Forest Service is not in violation of the Clean Water Act by not obtaining a NPDES permit. Per John Blanchard (Oregon DEQ); "The DEQ is not requiring permits for these types of forest activities".
30	Water Quality/ Other	The NEPA analysis must address the cumulative effects of logging and grazing on water quality and discuss the fact that further grazing will retard the attainment of riparian and aquatic management objectives in violation of the applicable land management plan as amended. Give it a long rest from grazing. The fire area must be rested from grazing. The NEPA analysis fails to disclose the significant adverse effects of livestock grazing in a post-fire landscape.	No grazing is proposed in the planning area; no grazing has occurred in the area for decades. Page 288 of the DEIS discloses that no rangelands exist in the project area.
32	Wildlife	For most wildlife species, including the Pacific fisher, Pacific fringed bat, the DEIS simply asserts that the impacts from the proposed actions will be less than the fire. In the <u>Blue Mountains Biodiversity Project v Blackwood</u> , a similar statement was rejected by the courts, "The proper evaluation should identify the impact of the increased sediment from the logging and roadbuilding on the fisheries habitat in light of the documented increases that already have resulted from the fire."	For the Pacific fisher, the DEIS clearly states that potential denning habitat would incur direct effects "... from salvaging dead trees within the burned late-successional habitats." (pg. 131). It further states that "Indirect effects would occur due to the salvage's effects on prey habitat, or large dead wood". The effect of the fire is discussed under the cumulative effects section. For the Pacific fringed myotis, the DEIS clearly states that timber harvesting is expected to directly impact roosting habitat through the felling of large dead trees and snags (pg. 133). It further states that indirect effects would likely occur from changes in prey base (insect populations) resulting from post-harvest and prescribed burning related changes in vegetation. The effect of the fire is discussed under the cumulative

Letter Number	Subject of Concern	Comment	Forest Service Response
			effects section. Cumulative effects analyses consider past, present and reasonably foreseeable actions.
32	Wildlife	The DEIS claims that the Baked Apple Project will meet ACS objective #1 by not increasing or decreasing the amount of early or late-successional habitat outside of its natural range variability (DEIS p 102) but five pages later the DEIS admits that it will decrease late-successional habitat by another 137 acres (DEIS p 107)	The DEIS does not state that the project will decrease late-successional habitat. It states that salvage logging would “simplify stand structure” (pg. 106) not decrease (remove) it. The project does not affect the amount of late-successional habitat until approximately 2080, as shown in Figure 42 on page 110.
32	Wildlife	Un-salvaged burned areas are rare in western Oregon and given the new emphasis on maintaining viability of neo-tropicals and other species associated with fire areas, as many snags as possible should be retained. This project will negatively impact species like neotropical migrants, and the Baked Apple Project will contribute towards federal listing or cause a loss of viability. This was not disclosed or analyzed in the DEIS.	The direct, indirect and cumulative impacts to neotropical birds are disclosed on pages 140-146. Page 103 of the DEIS discusses the “rarity” of un-salvaged burned areas within the Middle North Umpqua watershed, and how the fire increased this habitat type back into its estimated natural range. The WEEP document (pg. 45-46) also discloses this information.
30	Wildlife	The EIS shows the Forest Service bias by considering snag fall only when it benefits them. Snag fall was considered a fuel problem that must be addressed by logging, and slash was considered a benefit in terms of soil coverage, but the Forest Service failed to consider the fact that most of the few snags retained after logging will fall and deprive wildlife of much needed snag habitat for many decades before the stands grow and begin recruiting new snags.	Pages 111 and 117-118 discuss how snag decay and fall down rates were used to determine how much to leave to meet ROD C-40 over the next 100 years.
30	Wildlife	The EIS (p 104) says that bluebirds will migrate to other areas, but in fact won't many young bluebirds born here disperse to the death and/or starve to death. Let's not put a happy face on it. The DEIS (p 143) analysis for western bluebirds just says similar to olive –sided flycatcher. That is too vague and conclusory. These species have different needs that will be affected by the logging in different ways.	The analysis for western bluebirds discusses the affected environment and status of this species in the planning area (pg. 143). The disclosure of the project's direct, indirect and cumulative impacts on this species and its habitat (snags in early-successional habitat) are in fact quite similar to those for the flycatcher, as both species utilize the dead tree structure within this seral stage. Repetition of the impact discussion was felt to be unnecessary and avoided by reference to shorten the DEIS. Note that populations of this species are expected to increase (based on habitat changes and monitoring results) in the planning area under all alternatives (page 143).

Letter Number	Subject of Concern	Comment	Forest Service Response
5	Wildlife	How much impact will burning logging-created slash during the spring affect landbirds, as significant issue #8 suggests? There should not be as much impact to landbirds in burned areas, compared to green areas.	More discussion was added to the final EIS to describe the impacts of fire to breeding birds. The EIS does not distinguish between effects of landbirds in burned areas vs. green areas. However, all of the prescribed burning will occur within previously burned areas (from the wildfire), and the majority occurs within the early-successional (stand replaced) habitats.
27, 30, 32	Wildlife	The DEIS mentions several times that the Beschta 50% recommendations are undocumented. But the DEIS never gives us greater documentation for the DecAID 2.3% recommendation. There is a great deal of difference between 50% and 2.3%. Since Beschta is well known, the DEIS should have justified the use of the “DecAID tool” instead.	The DEIS provides a citation for DecAID (pg. References -7, under Marcot et al. 2002), but does not provide a URL for a website address that fully documents DecAID. This URL will be provided in the final EIS. The DEIS states that the 2.3% recommendation is based on minimum recommendations from DecAID for stand-level amounts of dead wood ground coverage in early-successional conifer stands for the western Cascades of Oregon (pg. 116). This percentage is based on forest inventory plot data and is not directly comparable to the 50% retention levels for retention of dead trees given by Beschta et al. (1995), which is based on expert opinions. One applies to % ground cover and the other applies to % retention of dead trees.
27, 30, 32	Wildlife	Utilization of DecAID is inappropriate for the Baked Apple project for several reasons. The program is simply a literature review of existing science regarding snag habitat, there is a lack of information on post-fire ecosystems used by cavity nesters, the output is based on the extrapolation of minimal data and it is being applied at the wrong scale. The FS has not disclosed key shortcomings of DecAID. The numbers generated by DecAID are well below what relevant science recommends for cavity excavators. The model does not address several MIS and cavity excavators found in the planning area. In addition, the FS has averaged snag retention levels and the 30% to 50% tolerance is insufficient to meet the requirements of the NWFP.	According to the developers of DecAID, it is being developed with the intent to be used broadly by land planners, timber consultants, and forest managers across all land ownerships in Washington and Oregon. DecAID is more than just a literature review of existing science regarding snag habitat and the species that use it. As the developers of DecAID describe it, DecAID is: 1. A thorough review of published literature and other available data on wildlife use of decayed wood elements, primarily in Oregon and Washington 2. A statistical synthesis of data showing levels of use by individual wildlife

Letter Number	Subject of Concern	Comment	Forest Service Response
			species of decayed wood elements 3. A summary of the patterns of use of decayed wood elements by wildlife species in Oregon and Washington (number of species using specific snag or down wood sizes or amounts) 4. Statistical summaries of forest inventory data on snags and down wood in unharvested forests and entire landscapes across Oregon and Washington 5. A helpful tool for making informed decisions The authors of DecAID do not state that it is inappropriate for use in post-fire ecosystems. They simply state that caution should be used when using forest inventory summaries, because the sample size for post-fire inventory plots is small. This was one of the reasons why a post-fire inventory of large snags and dead wood was conducted for Baked Apple (see DEIS pgs. 112 and 116). The results of this site-specific survey were used in conjunction with DecAID to provide a site-specific analysis. A site-specific inventory is used, not a study in Idaho. The Forest Service is aware of the caveats and cautions to be used with DecAID, especially dealing with post-fire data. Again, this is one reason why a planning area survey was conducted prior to the planning of the salvage. Although the developers of DecAID anticipated its use at multiple spatial scales, the DEIS describes the spatial scale that DecAID is recommended to be used at (pg. 116). The planning area fits this scale.

Letter Number	Subject of Concern	Comment	Forest Service Response
27, 30	Wildlife	The Forest Service never analyzed the impacts to wildlife from logging within roadless areas over 1,000 acres, two of which are in most of the proposed alternatives, Limpy Creek and Horseshoe Bend. Scientists have determined that roadless areas over 1,000 acres are important to species dependent on old-growth forests. This remains true even for burned forests. This lack of analysis in the DEIS must be corrected. Salvage logging in un-roaded areas is inappropriate. Salvage logging will irrevocably harm the values of this area for high quality fish habitat, complex wildlife habitat, water quality, recreation, weed suppression, less risk of human caused fire, reference landscape, ect. Further disclosure, analysis, and protection needs to be addressed that consider unimpeded operation of natural ecological processes, water quality, healthy soils; fish; and wildlife refugia, centers for dispersal, recolonization, and restoration of adjacent disturbed sites, reference sites for research, non-motorized low-impact recreation, carbon sequestration, refugia that are relatively less at risk from noxious weeds and other invasive non-native species, and many other significant values. See Forest Service Roadless Area Conservation FEIS, November 2000.	The wildlife analysis took into account the location of all proposed salvage units and temporary roads, including the spatial arrangement of units and roads in and adjacent to the two low road density areas. As described in the DEIS on page 278-280, the effects of the proposed activities on the low road density areas took into account the impacts on habitat and on solitude. Page 115 of the DEIS graphically displays the impacts to snags within the planning area and also shows how the two low road density areas would also be affected.
27, 32	Wildlife	The DEIS says that “Timber harvesting is expected to directly impact roosting habitat for the Pacific Fringed Bat through the felling of large dead trees and snags. The DEIS does not give any survey or bat population results, and thus does not have enough information to conclude that “the action alternatives may impact individuals or habitat but is not likely to contribute to a trend toward federal listing or loss of viability.	Based on the prefield review of known sites and field reconnaissance of potential habitats within the proposed salvage units, the DEIS discloses that it is probable that this species occurs within and adjacent to salvage units (Table 29, page 120; 132-133). As stated on page 134, the conclusion that the impact to the species is not likely to contribute to a trend toward listing or loss of viability was based on the analysis that showed that dead tree (roost) habitat has increased (as a result of the fire) and will remain within its estimated natural range (for all action alternatives) within the planning area (Figure 48, pg. 118). In addition to this, the cave discovered during field recon (pg. 133) will receive a 250 foot no-harvest buffer in accordance with Northwest Forest Plan standards and guidelines.

Letter Number	Subject of Concern	Comment	Forest Service Response
27, 30	Wildlife	The proposed alternative will have the highest impact on landbirds due to the highest number of acres of logging slash broadcast burned in the spring, and the largest number of acres of loader logging. The DEIS failed to consider the cumulative effects to all the landbirds (not just individual species) of spring time logging slash burns.	Direct, indirect and cumulative impacts to neotropical migratory birds are discussed in the DEIS (pgs. 140-146). In addition, a breeding bird survey route, through the planning area, was established in 2003. The results of the first year's monitoring are summarized in a report available on the web, and discussed in the DEIS. The ecological importance of wildfire-created patches of snags is discussed in several locations throughout the DEIS (pgs. 102-105, 110-115). This subject is also discussed in the Wildfire Effects Evaluation Project (USDA 2003, pgs. 43-49), which the DEIS incorporated by reference (DEIS pg. 1 - Introduction).
30	Wildlife	The DEIS statement of purpose and need (page 5) fails to recognize the habitat values of the Matrix. The DEIS says that the desired future condition of the matrix is to provide "commodities" (p 8) but that is not all. Matrix is not a sacrifice zone and should not be converted to simplified tree farms. The Northwest Forest Plan ROD (p B-6) says: Stands in the matrix can be managed for timber and other commodity production, and to perform an important role in maintaining biodiversity. Silvicultural treatments of forest stands in the matrix can provide for retention of old-growth ecosystem components such as large green trees, snags and down logs, and depending on site and forest type, can provide for a diversity of species. Retention of green trees following timber harvest in the matrix provides a legacy that bridges past and future forests. Retaining green trees serves several important functions including snag recruitment, promoting multistoried canopies, and providing shade and suitable habitat for many organisms in the matrix. "Coarse woody debris is essential for many species of vascular plants, fungi, liverworts, mosses, lichens, arthropods, salamanders, reptiles, and small mammals. Because of drier microclimates, logs in the matrix may be occupied by species different from those found on coarse woody debris in late-successional forests. However, those logs may provide transitional islands for the maintenance and eventual recovery of some late-successional organisms in the matrix."	The Apple fire burned across nearly 18,000 acres of early, mid, and late seral forests in the Middle North Umpqua Watershed. This burn perimeter included approximately 5,400 acres of high intensity burn, 1,990 acres of mosaic burn, and 9,500 acres of underburn. Harvest will be confined to the high intensity burn areas within the Panther Creek subwatershed. The maximum acreage affected by salvage in any alternative would be 1,432 acres all within high intensity burn areas. Green tree removal will be limited to hazard trees and those needing to be removed for logging systems. All snag and down woody debris levels will either meet or exceed LRMP standards and guides under all alternatives as outlined in the LRMP pg. IV-69.

Letter Number	Subject of Concern	Comment	Forest Service Response
		Clearly, the matrix is intended to develop and provide complex forest habitat. This complexity will be best achieved by retaining large trees and down logs that will provide a host of environmental services. The FEMAT report indicates that “because the matrix provides habitat and connectivity for many organisms, post-disturbance management must achieve a balance between economic and ecosystem objectives.” FEMAT IV-37. The NFP ROD also says that commercial salvage will be “less constrained” in the matrix, but it does not say that salvage will be unconstrained. See also Rose et al. 2001.	
30	Wildlife	The Forest Service has misconstrued the concept of historic range of variability. The watershed analysis page 65 indicates that patches of dead trees are “highly deficit” in this watershed due to logging and salvage. The EIS also accurately described early seral stands that result from clearcuts and salvage as very different from early seral with abundant snags. The EIS indicates that the Apple Fire created an overabundance of early seral stands with snags, so justifies logging many of these stands. This characterization of “too much” early seral with snags cannot be reconciled with the fact that the Apple Fire itself was not outside the historic range of variation (which the DEIS repeatedly described as windy, steep, and prone to intense fire), so the fire cannot have created an overabundance of early seral conditions. The DEIS analysis of ACS objective 1 must be rewritten to conclude that the watershed is NOT outside historic range of variability for early seral with snags.	The DEIS does not conclude that the watershed is outside historic range for early seral with snags. The DEIS states that early-successional habitat within the planning area consists of two different structure types; 1) devoid of dead trees (e.g. clearcuts and 2) with high densities of dead trees (e.g., post-fire) (pg. 102). The DEIS states that the total acreage of early-successional habitat is above its estimated natural range (figure 36)...“this deviation is mainly caused by clearcut harvesting”. It further states, “The amount of early-successional habitat with high densities of dead trees is now within its estimated natural range, even though total acreage of early-successional habitat is higher than it is estimated to naturally occur” (pg, 103). The natural range of early seral with snags is also disclosed in Figure 48, page 118.
30, 32	Wildlife	The EIS (p 105) indicates that the preferred alternative will leave only 17% of the planning area in a burned and unsalvaged condition, the EIS also concludes without any support that this is still “higher than the estimated natural range of variability for this type of habitat” even though “large fires are common in this watershed” (p 108). This requires further analysis. a. Both Figure 36 on page 101 and Figure 48 on page 118 show that the existing condition is outside the historic range of variability. This is highly suspect because this area has	The information on page 105 states that between 17% and 28% of the early-successional habitat in the planning area would not be salvaged or planted (over 1,600 acres of burned plantations that will be reforested are included in this calculation.) When examining the acres where only salvage is proposed, of the 2,066 acres of early-successional habitat with snags created by the fire, Alternative 4 proposes to salvage 65% of those acres, leaving 45%

Letter Number	Subject of Concern	Comment	Forest Service Response
		historically experienced lots of large fires. b. We need to know the real historic range of variability for early seral with snags based on an analysis like Wimberly et al. 2000 did for the coast range. See Michael C. Wimberly, Thomas A. Spies, Colin J. Long, and Cathy Whitlock, "Simulating historical variability in the amount of old forests in the Oregon coast range," <i>Conservation Biology</i>, pages 167-180, Volume 14, no. 1, February 2000. http://www.fs.fed.us/pnw/pubs/journals/0010.pdf c. We need to know the consequences of all the alternatives on moving toward or maintaining this rare habitat type (early seral with snags). d. The bands for "natural range" on the top half of Figure 36 (p 101) should add up to 100%. e. The "historic reference" may have been based on a snapshot in time (1946). This is not scientifically credible. f. The Forest Service must consider not just this watershed area but must consider multiple scales and the regional dearth of early seral with snags. The NEPA document repeatedly invokes the concept of "historic range of variability" (HRV) to justify industrial intervention such as logging and roading. However, the HRV concept is meaningless unless a scale is specified (preferably both a temporal and spatial scale). The scale of determining the historic range of variability is critical. At small scales, the amount of old forest varied from zero to 100 percent depending on how recently the site was disturbed by intense fire, flood, volcanism, etc. HRV at this scale is meaningless and must never be used as an excuse to destroy old forests. But at very large scales, such as the Interior Columbia Basin, the condition of vegetation is a mosaic that reflects the effects of fires and other disturbances. At these large scales, the historic range of variability begins to approach the amounts of young and old forest expected based on the fire return interval for stand replacing fires.	of the early-successional habitat with snags unsalvaged. Alternative 6, the preferred alternative in the FEIS, salvages less. Figure 36 on page 101 shows that the estimated range for this type of habitat is between 4-12% of the land area in the planning area. Therefore, the amount of early-successional habitat that will not be impacted by the project is higher than the estimated natural range for this area. A – The reason why early-successional habitat is above the estimated natural range is explained on page 102-103. The 4-12% natural range is based on historic large fires in the planning area as shown in the watershed analysis (figure 9, page 21). B – The Wimberly et al. model is based on charcoal analysis of lake sediment from lakebed core samples. The scarcity of their sediment core data limited their ability to estimate fire sizes, so they used mapping of relatively recent large coastal range fires to estimate fire size. Lake core sampling is beyond the scope of conducting an analysis for salvage projects. However, just like Wimberly et al., the team utilized historical fire maps and aerial photographs to quantify a range of stand replacement patches (early seral with snags) within the planning area and the watershed in which it occurs in. C – The DEIS fully discloses the direct, indirect and cumulative impacts of each alternative for this habitat type on pages 110-119. D – The bands for natural range do not add up to 100%, however the bars representing each seral stage do. This is due to the fact that these bands represent the spatial fluctuation of each habitat independently of each other. When late-successional habitat is high, early-

Letter Number	Subject of Concern	Comment	Forest Service Response
		In the Northwest Forest Plan area and the Interior Columbia Basin, the amount of old forest, large trees, and early seral with large snags are far below the historic range of variability. If we look only at the 5th field watershed scale we will miss this larger pattern of loss of old complex and young complex forest structure. Those few watersheds that are at or above HRV should be managed and conserved to compensate for the many watersheds that are below HRV. All HRV references in the NEPA document must be clarified to specify a geographic and temporal scale and note that whether the same parameter is within the HRV at the more meaningful regional scale. g. For an issue like complex early seral habitat that is so dependent upon large and infrequent events like wildfire, the scale of analysis must be correspondingly large. This is highlighted by the fact that only 1.8% of the Umpqua National Forest is early seral with snags (p143). Even if will maintain HRV with the 6th field planning area, the salvage will affect push the large scale plan area away from HRV.	successional habitat is low. In nature, it is rare to find situations where each condition is at its maximum at the same time. E – The historic reference is actually based on two points in time – late 1800s and 1946 (watershed analysis, page 21). The 1946 maps are commonly used to represent a reference point due to the accuracy of mapping from 1946 aerial photography, giving us a pre-timber management perspective of this area. Reference periods such as this are commonly used to estimate “natural” conditions. F – The DEIS discusses this habitat type at multiple spatial scales, from the site (snags/acre – pages 111-112) to the planning area (pages 101, 105, 113, 115, 118), the forest-scale (pages 114, 143). The WEEP document (referenced on page 1 of DEIS) discusses the provincial scale of this habitat type (pg. 45-46) and shows a map of the provincial spatial arrangement in figure 36, page 46 of WEEP). G – Again, the WEEP document discloses large-scale conditions and shows a positive trend of this habitat type in figure 35, page 45.
30	Wildlife	ACSO #1 is also violated by salvage in underburned late-successional old growth. Page 101 clearly shows that LSOG is underrepresented and underburned LSOG is even more rare, so the FS can’t salvage any underburned LSOG and still comply with ACSO #1. Page 107 says that this logging will have insignificant effects but this belies the HRV facts.	The DEIS does show that LSOG is below its estimated natural range within the planning area, as a result of the Apple Fire. It does not discuss the rarity of underburned LSOG. All of the LSOG in the planning area has experienced fire at some point in time. The amount of underburned LSOG within the planning area is disclosed on pages 47-49 of the WEEP document (incorporated as a reference on page 1 of the DEIS) and Appendix D of the WEEP document (available on the web).
30	Wildlife	If conducted during the nesting season, the proposed harvest of timber will very likely kill nesting migratory birds in violation of the Migratory Bird Treaty Act.	The Migratory Bird Treaty Act is a criminal environmental statute, enacted in 1918. It’s applicability to federal agency actions is still unclear. However, a Presidential Executive Order (signed in January 10,

Letter Number	Subject of Concern	Comment	Forest Service Response
		Be sure to protect the following bird species of conservation concern to the U.S.: Yellow-billed Loon; Black-footed Albatross; Northern Goshawk (resident laingi ssp. only); Peregrine Falcon (including resident pealei ssp. in Alaska); Black Oystercatcher; Whimbrel; Long-billed Curlew; Marbled Godwit (beringiae ssp. only); Black Turnstone; Surfbird; Red Knot; Rock Sandpiper; Short-billed Dowitcher; Caspian Tern; Arctic Tern; Aleutian Tern; Marbled Murrelet (except where listed as Threatened); Kittlitz's Murrelet; Yellow-billed Cuckoo; Flammulated Owl; Black Swift; Rufous Hummingbird; Lewis's Woodpecker; White-headed Woodpecker; Olive-sided Flycatcher; Horned Lark (strigata ssp. only); Vesper Sparrow (affinis ssp. only).	2001) required the Forest Service to enter into a memorandum of understanding (MOU) with the US Fish and Wildlife Service. This MOU (signed on January 17, 2001) is designed to strengthen migratory bird conservation and avoid or minimize federal impacts to migratory birds. The MOU directs the Forest Service to incorporate comprehensive migratory bird planning efforts, such as the Partners in Flight Bird Conservation Plans. The proposed project incorporates this plan and is consistent with it (pages 140-146 of the DEIS). A breeding bird survey route was also established within the planning area in 2003 to conduct long-term monitoring of local bird population trends, consistent with section C-5 of the MOU. Effects to migratory birds were considered in the DEIS (pages 140-146). As documented in the DEIS, of the 20 landbirds that are listed in the conservation plan for Westside Coniferous Forests, only four species would potentially be affected by the project. These include the olive-sided flycatcher, western bluebird, orange-crowned warbler, and rufous hummingbird. The effects to peregrine falcon were also disclosed (DEIS pages 127-129). Cavity nesting species were addressed on pages 110-115. None of the other species listed by the commenter either occur within the analysis area or fall within categories that require disclosure.
30	Wildlife (WA)	The watershed analysis page 84 describes Vaux's swifts as a snag-dependent species that needs special management attention, but the DEIS does not discuss this species.	The landbird conservation plan categorizes the Vaux's swift as a focal species for large snags within late-successional/old-growth forest conditions. As this project mainly focuses on salvaging within the early-successional (stand replaced) habitat, the landbird discussion focuses primarily on early successional species. However, additional discussion was included in the final EIS to relate the impacts of late-successional habitat to impacts on Vaux's swift.

This page intentionally left blank.

References Cited

- Adams, Clarence. Personal Communication - March 23, 2004.
- Adams, W.T., J. Zuo, J.Y. Shimizu, and J. C. Tappeiner. 1998. Impact of Alternative Regeneration Methods on Genetic Diversity in Coastal Douglas-Fir. *Forest Science*, Vol. 44, No.3, pages 390-396.
- Agee, James K. 1993. *Fire Ecology of the Pacific Northwest*. Washington, DC: Island Press. 493 p.
- Altman, B. 2000. Olive-sided flycatcher nest success and habitat relationships in post-fire and harvested forests of western Oregon. Unpublished report. 32pp.
- Altman, B. and R. Sallabanks. 2000. Olive-sided Flycatcher. *In* A. Poole and F. Gill, (eds.) *The Birds of North America*, No. 502. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.
- Amaranthus, M. P., D. Page-Dumroese, A. Harvey, E. Cazares, and L. Bednar, 1996. Soil compaction and organic matter affect conifer seedling nonmycorrhizal and ectomycorrhizal root tip abundance and diversity, USDA Forest Service, PNW-RP-494.
- Amaranthus, M., H. Jubas, and D. Arthur. 1989. Stream shading, summer streamflow and maximum water temperature following intense wildfire in headwater streams.
- Amman, Gene D., and Kevin C. Ryan. 1991. Insect Infestation of Fire-Injured Trees in the Greater Yellowstone Area.
- Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. Gen.Tech. Rep. INT-122.
- Anthony, R.G., Forsman, E.D., Green, G.A., Witmer, G. and S.K. Nelson. 1987. Small mammal populations in riparian zones of different-aged coniferous forests. *The Murrelet* 68, 94-102.
- Anthony R., S. Ackers, R. Claremont, J. LaVoie, D. Giessler, N. Seaman, J. Schilling and S. Turner-Hane. 2002a. The ecology of northern spotted owls (*Strix occidentalis caurina*) on the Willamette National Forest, Oregon: Habitat use and demography. Annual research report. 27p.
- Anthony R., S. Andrews, F. Wagner, W. King, T. O'Brien, T. Phillips, G. Rible and M. Shannon. 2002b. Demographic characteristics of spotted owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades. Annual research report. 23p.
- Arnett, E. and J.P. Hayes. 2002. Influence of landscape characteristics on abundance and use of habitat by bat communities in the central Oregon Cascades. Cooperative Forest Ecosystem Research Program - CFER annual report. Corvallis, OR. p. 51-53.

- Aubry, K.B., M.J. Crites and S.D. West. 1991. Regional patterns of small mammal abundance and community composition of Oregon and Washington. Pages 285-94 in L. F. Ruggiero, K. B. Aubry, A. B. Carey, and M. H. Huff, tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA For. Serv. Gen. Tech. Rep. PNW-285. Portland, OR.
- Aubry, K.B. and C.M. Raley. 2002. Ecological characteristics of fishers in the southern Oregon Cascade Range. Final progress report: June 2002. USDA For. Serv., Pacific Northwest Research Station, Olympia, WA.
- Aubry, K.B. and J.C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. Biological Conservation, in press.
- Barker, Paul F. 1989. Timber salvage operations and watershed resource values. In: Berg, Neil H., tech. coord. Proceedings of the symposium on fire and watershed management; 1988 October 26-28; Sacramento, CA. Gen. Tech. Rep. PSW-109. Berkeley, CA: USDA Forest Service, Pacific Southwest Forest and Range Experiment Station: 1-2. Available from: National Technical Information Service, Springfield, VA 22161; PB89-228639.
- Bate, L.J., Garton, E.O. and M.J. Wisdom. 1999. Estimating snag and large tree densities and distributions on a landscape for wildlife management. Gen. Tech. Rep. PNW-GTR-425. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.
- Bouwman, Alex F., and Rik Leemans. 1995. The Role of Forest Soils in the Global Carbon Cycle. Carbon Forms and Functions in Forest Soils. Mcfee and Kelly Editors. Copyright, Soil Science Society of America.
- Bendell, J. F. 1974. Effects of fire on birds and mammals. Pages 73-138 in T.T. Kozlowski and C.E. Ahlgren, eds. Fire and ecosystems. Academic Press, New York.
- Bennett, K.A. 1982. Report to the Siuslaw National Forest. Effects of slash burning on surface soil erosion rates in the Oregon Coast Range.
- Beschta, Robert L. 1990. Effects of fire on water quantity and quality. In: Walstad, John D., S.R. Radosevich, D.V. Sandberg, eds. Natural and prescribed fire in Pacific Northwest Forest. Corvallis, Oregon State University Press: 219-232 .
- Beschta et. al. 1995. Wildfire and Salvage Logging: Recommendations for Ecologically Sound Post Fire Salvage Management and Other Post-Fire Treatments on Federal Lands in the West.
- Bjornn, T.C. and D. W. Reiser. 1991. Habitat Requirements of Salmonids in Streams: Influences of Forest and Range Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. Bethesda, MD, USA.
- Bouwman and Leemans 1995. The Role of Forest Soils in the Global Carbon Cycle. Carbon Forms and Functions in Forest Soils. Mcfee and Kelly Editors. Copyright, Soil Science Society of America.

Brown, G. W. 1969. Predicting temperatures of small streams. *Water Resource. Res* 5 (1):68-75.

Brown, James K. 1980. Influence of harvesting and residues on fuels and fire management. In: *Proceedings, Environmental consequences of timber harvesting in Rocky Mountain coniferous forests; 1979 September 11-13; Missoula, MT. Gen. Tech. Rep. INT-90. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 417-432.*

Brown, J., Reinhardt, E., and Kramer, K. 2001. Coarse woody debris and succession in the recovering forest. *USDA Forest Service.*

Carey, A.B. 1991. The Biology of arboreal rodents in Douglas-fir forests. *USDA Forest Service Gen. Tech. Rep. PNW-GTR-276. 46pp.*

Catton, T.J.. December 2001. Personal communication on fishers.

Choromanska U. and T.H. De Luca. 2001.

Cissel, J.H., F.J. Swanson, G.E. Grant, D.H. Olson, G.V. Stanley, S.L. Garman, L.R. Ashkenas, M.G. Hunter, J.A. Kertis, J.H. Mayo, M.D. McSwain, S.G. Swetland, K.A. Swindle and D.O. Wallin. 1998. A landscape plan based on historical fire regimes for a managed forest ecosystem: the Augusta Creek study. *Gen. Tech. Rep. PNW-GTR-422. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 82pp.*

Cissel, John; ed. 2002. *Blue River Landscape Study: Landscape Management and Watershed Restoration Strategy - Version 2. Unpublished report. Available on line at: <http://www.fsl.orst.edu/ccem/brls/BRLPV2.pdf>.*

Cole, E.K., M.D. Pope and R.G. Anthony. 1997. Effects of road management on movement and survival of Roosevelt elk. *Journal of Wildlife Management* 61(4):1115-1126.

Cristy, R.E. and S.D. West. 1993. Biology of bats in Douglas-fir forests. *USDA Forest Service Gen. Tech. Rep. PNW-GTR-308. 27pp.*

Cross, S.P., H. Lauchstedt and C. Harmes. 1996. Characterizing forest roost sites of some bats of special concern occurring in Roseburg and Medford BLM Districts. *Final Report - Department of Biology. Southern Oregon State College, Ashland, OR. 47pp.*

Dambacher, J. M. 1991. Distribution, abundance, and emigration of juvenile steelhead (*Oncorhynchus mykiss*), and analysis of stream habitat in the Steamboat Creek basin, Oregon Master's thesis. *Oregon State University, Corvallis.*

Davis, Raymond J. 2003. Snag and down wood inventory of the Baked Apple Planning Area. On file at the North Umpqua Ranger District.

Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater and M.H. Reiser. 1999. Effects of helicopter noise on nesting Mexican spotted owls. *Journal of Wildlife Management.* 63: 60-76.

References Cited

Denning, Cliff, 1994, Root Strength and Tree Surcharge (Section 4F): in, David E. Hall, Michael T. Long, and Michael D. Remboldt, eds., Slope Stability Reference Guide for National Forests in the United States: U.S. Dept. Agriculture, Forest Service, Engineering Staff, Washington, DC, EM-7170-14, v. II, p. 543-548.

Dietrich, William E., and David R. Montgomery. 1998. SHALSTAB, A digital terrain model for mapping shallow landslide potential: Technical Report, National Council of the Paper Industry for Air and Stream Improvement, Corvallis, Oregon, 26p.

Duncan, Nancy. February 2003. Personal communication. Survey and Manage Mollusk Taxa Lead. p108.

Elliot, W. J., and D. E. Hall, 1997. Water Erosion Prediction Project (WEPP) forest applications. General Technical Report INT-GTR-365. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Elliot, W. J., Robicaud, P. R. and D. E. Hall, Cuhaciyan, C. O., Pierson F. B., Wohlgemuth, P. M. 2001. A Probabilistic Approach To Modeling Erosion For Spatially Varied Conditions, Presentation to American Society of Agriculture Engineers, Sacramento, California.

Emerson, Clint. June 2003. Personal communication on Apple Fire revegetation.

Everett, Richard. 1995. Letter dated August 16 to John Lowe. Review of Beschta document. 8 p. On file with: USDA Forest Service, Pacific Northwest Research Station, 1133 N. Western Ave., Wenatchee, WA 98801.

Evers, L. 2002. Addressing the issues raised in the 1995 Beschta Report on Post-fire Salvage Logging, Oregon State Office, Pacific Northwest Region, Portland, Oregon.

Farrell, T., M. Widmann and R. Davis. 1996. Report on the 1995-96 survey to determine the occurrence, distribution and habitat associations of wolverine, fisher and marten in the Umpqua National Forest. ODFW Report 95-2-04. 22pp.

FEIS. 2003. Fire effects information system database. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online: <http://www.fs.fed.us/database/feis>.

FEMAT. 1993. Forest Ecosystem Management: an ecological, economic and social assessment. Report of the Forest Ecosystem Management Team.

Finney, Mark A. 1998. FARSITE; Fire Area Simulator - Model Development and Evaluation. RMRS-RP -4. Ogden, UT; USDA Forest Service, Rocky Mountain Research Station. 47pp.

Fischer, W.C. 1980. Prescribed fire and bark beetle attack in ponderosa pin forest. Fire Management Notes. 4: 10-12.

Flanagan, P. 1996. Survival of fire-injured conifers. Fire Management Notes 56: 13-16.

Flanagan, S.A., M.J. Furniss, T.S. Ledwith, S. Thiesen, M. Love, K. Moore, J. Ory. 1998. Methods for inventory and environmental risk assessment of road drainage crossings. USDA, Forest Service. San Dimas Technology and Development Center, San Dimas, CA.

- Fontaine, B. L. 1988. An evaluation of the effectiveness of instream structures for steelhead trout rearing habitat in the Steamboat Creek basin. Master's thesis. Oregon State University, Corvallis.
- Forde, Jon D. 1983. The effect of fire on bird and small mammal communities in the grasslands of Wind Cave National Park. Masters Thesis. Michigan Technological University. Houghton, MI. 140pp.
- Forsman, E.D., E.C. Meslow and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs 87. 64 pp.
- Forsman, E.D., J. A. Reid, S.A. Graham, J.S. Mowdy and A.L. Price. 2002. Demographic characteristics of northern spotted owls (*Strix occidentalis*) on the Tyee study area, Roseburg, Oregon: 1985-2002. Annual research report. 12p.
- Franklin A.B., K.P. Burnham, G.C. White, R.J. Anthony, E.D. Forsman, C. Schwarz, J.D. Nichols and J. Hines. 1999. Range-wide status and trends in northern spotted owl populations. Status report. Colorado State University, Fort Collins, CO and Oregon State University, Corvallis, OR. 71pp.
- Furniss, M .M. 1965. Susceptibility of fire-injured Douglas-fir to bark beetle in southern Idaho. Journal of Forestry 63: 8-11.
- Furniss, R. L., and V. M. Carolin. 1977. Western forest insects. USDA Forest Service. Miscellaneous Publications No. 1339. 654 p.
- Furniss, M.J., T.S. Ledwith, M. Love, B.C. McFadin, and S.A. Flanagan. 1998. Response of road-stream crossings to large flood events in Washington, Oregon, and
- Gebert, Krista M., & Charles E. Keegan III, Sue Willits, Al Chase. 2002. Utilization of Oregon's Timber harvest and Associated Direct Economic Effects. Pacific Northwest Research Station General Technical Report ONW-GTR-52.
- Gomez, D.M. and R.G. Anthony. 1998. Small mammal abundance in riparian and upland areas of five seral stages in western Oregon. Northwest Sci. 72:293-302.
- Good, D.A. and D.B. Wake. 1992. Geographic variation and speciation in the torrent salamanders of the genus *Rhyacotriton* (Caudata: Rhyacotritonidae). Univ. California Publications in Zoology. 126:1-91
- Graham, S. A. 1925. The felled tree trunk as an ecological unit. Ecology 6(4): 397-411.
- Grifantini, Michael C.; Stuart, J.D.; Fox, L., III. 1991. Deer habitat changes following wildfire, salvage logging and reforestation, Klamath Mountains, California. In: Proceedings of the symposium on biodiversity; 1991 October 28-30; Santa Rosa, CA. [Place of publication unknown]: [publisher unknown]: 163-167. As cited in: Mclver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

References Cited

- Grinnell, J. and T.I. Storer. 1924. Animal life in the Yosemite. University of California Press, Berkeley, CA.
- Hadfield, J.S., and R.W. Magelssen. 2000. Wood changes in fire-killed eastern Washington tree species- year five progress report. USDA Forest Service Wenatchee Service Center. 34p.
- Hagar, J.C., W.C. McComb, and C.C. Chambers. 1995. Effects of forest practices on wildlife, Chapter 9 *in* R.L. Beschta, J.R. Boyle, C.C. Chambers [and others]. Cumulative effects of forest practices in Oregon: literature and synthesis. Prepared for Oregon Department of Forestry. Oregon State University, Corvallis, OR.
- Harrington, M.G. 1987. Ponderosa pine mortality from spring, summer, and fall crown scorching. *Western Journal of Applied Forestry* 2: 14-16.
- Heinemeyer, K.S. and J.L. Jones. 1994. Fisher biology and management in the western United States. USDA Forest Service and Interagency Forest Carnivore Working Group Report. 109pp
- Helvey, J.D., A.R. Tiedemann, and T.D. Anderson. 1985. Plant nutrient losses by soil erosion and mass movement after wildfire. *Journal of Soil Water Conservation* 40:168-173.
- Hermann, Richard K., and William W. Chilcote 1965. effect of seedbeds on germinations and survival of Douglas-fir. Oregon State University, School of Forestry, Forest Research Laboratory Research Paper 4. Corvallis. 28 pages.
- Huff, M., J. Henshaw and E. Laws. 1997. Great gray owl survey status and evaluation of guidelines for the Northwest forest plan. Available online at the following URL: <http://www.or.blm.gov/surveyandmanage/SP/Great%20Gray%20Owl/icover.htm>
- Hunter, M.G. 1998. Watershed-level patterns among stream amphibians in the Blue River watershed, West-Central Cascades of Oregon. Masters Thesis, Oregon State Univ., Corvallis, OR. 97pp.
- Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (USA) conifer forests. *Conservation Biology* 9(5):1041-1058.
- Isaacs, Frank. September 2003. Personal communication on bald eagles.
- Jones, J. A., and G. E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, Western Cascades, Oregon. *American Geophysical Union. Water Resources Research*, vol. 32 (4): 959-974.
- Jones, J. A. 2000. Hydrologic processes and peak flow discharge response to forest removal, regrowth and roads in ten small experimental basins, Western Cascades, Oregon. *Water Resources Research*.
- Jurgensen, M. F., A. E Harvey, R. T. Graham, D. S. Page-Dumroese, J. R. Tonn, M.J. Larsen, and T.B. Jain. 1997. Impacts of timber harvesting on soil organic matter, nitrogen, productivity and health of Inland Northwest forests. *For. Sci.* 43: 234-251.

- Kimmey, J.W. 1955. Rate of deterioration of fire-killed timber in California. USDA Circular No. 962. Washington, D.C. 22 p.
- Kimmey, J.W., and R.L. Furniss. 1943. Deterioration of fire-killed Douglas-fir. USDA Technical Bulletin No. 851. Washington, D.C. 61 p.
- Kimmins, J. P. 1996. Forest Ecology, A Foundation for Sustainable Management. 2nd ed. Prentice-Hall. NJ. p61.
- Kline, LeRoy. 1996. 1995 "forest health" update. Unpublished paper presented to the Oregon Board of Forestry. 5 p. Available from: <http://www.odf.state.or.us/FH/BDFOR.HTM>.
- Klock, G.O. 1975. Impacts of five post-fire salvage logging systems on soil and vegetation. J. of Soil and Water Conservation. 30(2): 78-81.
- Lancaster, S.T., S.K. Hayes and G.E. Grant. 2001. Modeling sediment and wood storage and dynamics in small mountainous watersheds. Geomorphic Process and Riverine Habitat Water Science and Application. Vol 4, pages 85-102.
- Landsberg, Johanna and A. R. Tiedemann. 2002. Fire Management. In: Dissmeyer G.E., ed. Drinking water from forest and grasslands. Gen. Tech. Rep. SRS-39 Asheville, North Carolina: Department of Agriculture, Forest Service, Southern Research Station: 124-138.
- Leonard, W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Seattle, WA. 168pp.
- Lightcap, Scott. September 2003. Personal communication regarding the Diamond Lake Restoration Project.
- Lint J., R. Horn, F. Oliver, C. Larson, , K. Krause, M. O'Hara, M. Oleri, H. Wise, M. Irwin, K. Fukuda and P. Colvard. 2002. Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the Klamath Mountain Province of Oregon 1983-2002. Annual research report. 23p.
- Lint, Joe. 2003. Personal communication on northern spotted owls.
- Lowell, E.C., S.A. Willets, and R.L. Krahmer. 1992. Deterioration of fire-killed timber in the western United States. USDA Forest Service, Pacific Northwest Research Station General Technical Report PNW-GTR-292. 27 p.
- Lowell, Eini C., & James M. Cahill. 1996 Deterioration of Fire Killed Timber in Southern Oregon and Northern California. West. J. Appl. For. 11(4):125-131.
- Lyon, L.J, M.H. Huff, R.G. Hooper, E.S. Telfer, D.S. Schreiner and J.K. Smith (eds.). 2000. Wildland fire in ecosystems: Effects of fire on fauna. Gen. Tech. Rep. RMRS-GTR-42-vol. 1. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 83pp.
- Marcot, Bruce G., Kim Mellen, Janet L. Ohmann, Karen L. Waddell, Elizabeth A. Willhite, Bruce B. Hostetler, Susan A. Livingston, Catherine Ogden, and Tina Dreisbach. 2002. The DecAID repository: background information for DecAID, the decayed wood advisor for

managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. USDA Forest Service, Pacific Northwest Research Station and Pacific Northwest Region, Portland, Oregon.

Marshall, D.B., M.G. Hunter and A.L. Contreras, Eds. 2003. Birds of Oregon: A general reference. Oregon State University Press, Corvallis, OR 768 pp.

Martin, D.A. and J.A. Moody. 2001. Comparison of Soil Infiltration Rates in Burned and Unburned Mountainous Watersheds. *Hydrol. Process*, 15. PP 2893-2903.

McCullough, B. 1991. Final report of a cavity nesting bird study on the Mount Hood National Forest. Unpublished report. 30pp.

McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

McDade, M. H., F. J. Swanson, W. A. Mckee, J. F. Franklin, and J. Van Sickle. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. *Canadian Journal of Forest Research* 20: 326-330.

McDonald, Lee H., Alan W. Smart, Robert C. Wissmar, 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska: U. S. Environmental Protection Agency, Water Division, and Center of Streamside Studies. EPA/910/-91-001, 166 p.

McGarigal, K. 1993. Relationships between landscape structure and avian abundance patterns in the Oregon Coast Range. Ph.D. diss., Oregon State University, Corvallis, OR.

McGarigal, K. and W.C. McComb. 1995. Relationships between landscape structure and breeding birds in the Oregon Coast Range. *Ecol. Monogr.* 65(3):235-260.

Mellen, K. and A. Ager. 2002. A coarse wood dynamics model for the western Cascades. *in* W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). Proceedings of the symposium on the ecology and management of dead wood in western forests, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181:503-516.

Miller, J.M., and F.P. Keen. 1960. Biology and control of the western pine beetle: a summary of the first fifty years of research. USDA Forest Service Miscellaneous Publication No. 800. 381 p.

Montgomery, David R., Wright, Robert H., and Booth, Thom. 1991. Debris flow hazard mitigation for colluviums field swales: Bulletin of the Assoc. of Engineering Geologists, V.XXVIII, No 3, p. 303-323.

Monleon, V. J., K. Cromack Jr., and J.D. Lansberg. 1997. Short - and long term effects of prescribed underburning on nitrogen availability in ponderosa pine stands in central Oregon. *Canadian Journal of Forest Research*. 27(3): 369-378.

- Murphy, M. L., and K. V. Koski. 1989. Input and depletion of woody debris in Alaska streams and implications for streamside management. *North American Journal of Fisheries Management* 9: 427-436.
- Nussbaum, R. A., E. D. Brodie, Jr. and R. M. Storm. 1983. *Amphibians and reptiles of the Pacific Northwest*. Univ. Press of Idaho. 332pp.
- ODFW. 2003. Oregon's elk management plan. Oregon Department of Fish and Wildlife, Portland, OR. 58pp.
- Ohmann J. L., W.C. McComb and A.A. Zumrawi. 1994. Snag abundance for primary cavity-nesting birds on nonfederal forestlands in Oregon and Washington. *Wildlife Society Bulletin* 22(4):607-620.
- Oliver C. D. and B. C. Larsen. 1996. *Forest Stand Dynamics*. Wiley and Sons, Inc. New York.
- OLMIS. Oregon Labor Market Information System. (2000). Summary Covered Employment and Payroll Report, Douglas County, 2000. Oregon Employment Department. Available at WWW: <http://www.olmis.org>
- OMB A-94. Office of Management and Budget Circular No. A-94. (1992, October, revised 1999). Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. Washington, D. C: Author.
- Ormsbee, Pat. July 2002. Personal communication on bats.
- Page-Dumeroose, Deborah; Jurgenen, M; Harvey, A. 2002. Fire and Fire Suppression Impacts on Forest Soil Carbon. Rocky Mountain Research Library, (Unpublished final Report #00-JV-11222062-550).
- Park, Chris 2003. Draft, sufficiency Analysis for Stream Temperature: evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards. U. S. Forest Service and Bureau of Land Management.
- Partners In Flight (PIF). 2000. Landbird conservation plan: Westside coniferous forests. Partners in Flight. http://community.gorge.net/natres/pif/westside_page1.html.
- Perry, D.A., R. Molina, and M.P. Amaranthus. 1987. Mycorrhizae, mycorrhizospheres, and reforestation: current knowledge and research needs. *Canadian Journal of Forest Research*. 17(8):929-940.
- Peterson, D. L. and M. J. Arbaugh. 1986. Post fire survival in Douglas-fir and lodgepole pine: comparing the effects of crown and bole damage. *Canadian Journal of Forest Research* 16:1175-1179.
- Pilliod, D.S., R.B. Bury, E.J. Hyde, C.A. Pearl and P.S. Corn. 2003. Fire and amphibians in North America. *Forest Ecology and Management*. 178(1-2): 163-181.

References Cited

- Radtke, Sherman and Rudolph V. Edwards, Jr. 1976. Soil Resources Inventory. R-6, Umpqua National Forest, Roseburg, OR.
- Robichaud, P. R. and R.E. Brown. 1999. What Happened After the Smoke Cleared: Onsite Erosion Rates After a Wildfire in Eastern Oregon. Proceeding of the Annual Summer Specialty Conference (Track 2: Wildland Hydrology), 419-426. June 30-July 2, 1999, Bozeman, MT. Herndon, VA: American Water Resources Association.
- Rothermel, Richard C. 1983. How to Predict the Spread and Intensity of Forest and Range Fires, PMS 436-1, NFES 1573, June 1983.
- Ryan, K. C. 1990. Predicting prescribed fire effects on trees in the interior West. In; M. E. Alexander, G. F. Bisgrove technical advisors. The art and science of fire management. Proceedings of the First Interior West Fire Council Annual Meeting. Forestry Canada, Northern Forestry Center. P. 148-162.
- Ryan, K. C. and W. H. Frandsen. 1991. Basal injury from smoldering fires in mature Pinus Ponderosa Laws. International Journal of Wildland Fire 1: 107-118.
- Society of American Foresters. 1996. The role of "salvage" and "sanitation" harvesting in the restoration and maintenance of healthy forests [Position paper]. Available from: Society of American Foresters web page: www.safnet.org.
- Sauer, J. R., J.E. Hines and J. Fallon. 2003. The North American breeding bird survey, results and analysis 1966 - 2002. Version 2003.1, USGS Patuxent Wildlife Research Center, Laurel, MD.
- Scott, D.W., J. Szymoniak, and V. Rockwell. 1996. Entomological concerns regarding burn characteristics and fire effects on tree species during prescribed landscape burns: burn severity guidelines and mitigation measures to minimize fire injuries. USDA Forest Service, Wallowa-Whitman National Forest. BMZ 97-1. 48 p.
- Schwendeman, T. 1981. Dust Control Study, Gallatin National Forest. USDA Forest Service Region 1.
- Schultz, Dave. (1994, November) Deterioration of Salvage Trees. *Forest Pest Management*.
- Sessions, J., R. Buckman, M. Newton, and J. Hamann. 2003. The Biscuit Fire: Management Options for Forest Regeneration, Fire and Insect Risk Reduction, and Timber Salvage. College of Forestry, Oregon State University. 63 pp.
- Sexton, Timothy O. 1994. Ecological effects of post-wildfire salvage-logging on vegetation diversity, biomass, and growth and survival of Pinus ponderosa and Purshia tridentata. Corvallis, OR: Oregon State University, Department of Rangeland Resources. 28 p. Unpublished manuscript. On file with: Department of Rangeland Resources, Strand Agriculture Hall, Oregon State University, Corvallis, OR 97331. As cited in: McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

Shakesby, Richard A.; Coelho, Celeste de O.A.; Ferreira, António D. and others. 1993. Wildfire impacts on soil erosion and hydrology in wet Mediterranean forest, Portugal. *International Journal of Wildland Fire*. 3(2): 95-110. As cited in: McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

Sidle, Roy, 1985, Factors influencing the stability of slopes; in *Proceedings of a Workshop on Slope Stability, Problems and Solutions in Forest Management*: U.S Dept. of Agriculture, Forest Service, General Technical Report PNW-180, p. 17-25

Simon, Jerry, Stephen Christy, and Joseph Vessels. 1994. Clover-Mist fire recovery: a forest management response. *Journal of Forestry*. November: 41-44.

Siskiyou National Forest, 1997. Unpublished report Soil Disturbances from Helicopter Yarding in the Upper Pistol Timber Sale. Southwestern Oregon.

Sonoran, Institute. 2003. Population, Employment, Earnings and Personal Income Trends, Douglas County, OR. Sonoran Institute, Bozeman, Montana.

Spetler, Henry. 2002. Sawmill Closures, Openings, and Net Capacity Changes in the Softwood Lumber Sector, 1996-2003. Res. Pap. FPL-RP-603. Madison, WI: USDA, Forest Service, Forest Products Laboratory.

Spies, Thomas A.; Franklin, Jerry F. 1988. Old growth and forest dynamics in the Douglas-fir region of western Oregon and Washington. *Natural Areas Journal*. 8(3): 190-201. [7248].

Stevenson, Dwayne & Mark Miller, Kathi Riddell. 2001. Employment Projections by Occupation 2000-2010, region 6 (Douglas County). Oregon Employment Department, Salem, OR.

Swanston, Douglas N., and Frederick J. Swanson, 1976. Timber harvesting, mass erosion and steep land forest geomorphology in the Pacific Northwest: in Coates, Donald R., ed., *Geomorphology and Engineering*, Dowden, Hutchison & Ross, Inc. Stroudsburg, PA., p. 199-221.

Swezy, D. M. and J. K. Agee. 1990. Prescribed fire effects on fire fine roots and tree mortality in old-growth ponderosa pine. *Canadian Journal of Forest Research* 21:626-634.

Thomas, J.W. 2002. Dead wood: Foresters bane to environmental boon. In W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). *Proceedings of the symposium on the ecology and management of dead wood in western forests*, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181. p. 3-9

Thomas, T. L., and J. K. Agee., 1986. Prescribed fire effects on mixed conifer forest structure at Crater Lake, Oregon. *Canadian Journal of Forest Research* 16:1082-1087.

Toweill D. and J. W. Thomas (eds.). 2002. North American elk: ecology and management. Second edition. Smithsonian Institution Press. 1128pp.

References Cited

USDA Forest Service. 1975. Region 6 dead tree (snag) management policy. USDA Forest Service Manual 2405.14, Portland, OR.

USDA Forest Service. 1990. Umpqua National Forest Land and Resource Management Plan. Final Environmental Impact Statement and Record of Decision.

USDA Forest Service. 1994. American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, General Tech. Report RM-254, Rocky Mountain Research Station, Fort Collins, CO. 184pp.

USDA Forest Service. 1997. Idaho Panhandle National Forest, Sand Point Ranger District. Water Quality Effects of Three Dust Abatement Compounds.

USDA Forest Service. 1999. San Dimas Technology and Development Center. Dust Palliative Selection and Application Guide.

USDA Forest Service. 1999. Umpqua National Forest peregrine falcon site management plan. Working draft. Umpqua National Forest, Roseburg, OR. 49pp

USDA Forest Service. 2000. Landbird strategic plan. Washington, DC. 21pp.

USDA, Forest Service. 2001. Middle North Umpqua Watershed Analysis. Umpqua National Forest.

USDA Forest Service. 2001a. Watershed Analysis: North Umpqua River Wild and Scenic Corridor. North Umpqua Ranger District.

USDA Forest Service. 2002. Burned Area Emergency Response (BAER) report for the 2002 Apple Fire.

USDA Forest Service. 2003. Umpqua National Forest. Wildfire Effects Evaluation Project.

USDA Forest Service. 2003a. Umpqua National Forest. Baked Apple Roads Analysis. North Umpqua Ranger District.

USDA Forest Service, USDA Bureau of Land Management, and Oregon State Parks and Recreation Department. 1992. North Umpqua Wild and Scenic River. Environmental Assessment.

USDA/USDI, 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and its Amendments.

USDA Forest Service, USDI Bureau of Land Management. 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, Appendix J2 - Results of additional species analysis. Portland, Oregon. 475pp.

USDA Forest Service, USDI Bureau of Land Management. 1995. Great gray owl survey protocol. Portland, OR. 26 pp.

- USDA Forest Service, USDI Bureau of Land Management. 2000. Management recommendations for the Oregon red tree vole (*Arborimus longicaudus*). Version 2.0. Portland, Oregon. 25pp.
- USDA Forest Service, USDI Bureau of Land Management. 2001. Record of decision for amendments to the survey and manage, protection buffer and other mitigation measures standards and guidelines. Portland, Oregon. 106pp.
- USDA Forest Service, USDI Bureau of Land Management. 2003. Supplemental direction for identification of non-high priority sites for red tree vole within the "Pilot" Area. USDA Forest Service memorandum, BLM Instruction Memorandum OR-2003-062.
- USDA Forest Service, USDI Bureau of Land Management and U.S. Fish and Wildlife Service, 1998. South cascades late successional reserve assessment. Umpqua National Forest, Roseburg, OR. 255pp.
- USDI Bureau of Land Management. 1999. Field guide to survey and manage terrestrial mollusk species from the Northwest Forest Plan. USDI Bureau of Land Management, Portland, OR. 114pp.
- USDI Fish and Wildlife Service. 1982. Recovery plan for peregrine falcon (Pacific population). Portland, Oregon. 87pp.
- USDI Fish and Wildlife Service. 2000. 12-Month finding for a petition to list the southern torrent salamander. Federal register 65(109):35951-35956.
- USGS - United States Geological Survey. 1996. Water quality and algal conditions in the North Umpqua River Basin, Oregon, 1992-95, and implications for resource management.
- Verts, B.J. and L.N. Carraway. 1998. Land mammals of Oregon. Univ. of California Press, Berkley, CA. 800pp.
- Vesely, D. 1997. Terrestrial amphibian abundance and species richness in headwater riparian buffer strips, Oregon Coast Range. Master's thesis. Oregon State University, Corvallis.
- Weatherby, J.C., R.A. Progar, and P.J. Mocettini. 2001. Evaluation of tree survival on the Payette National Forest 1995-1999. USDA Forest Service, Intermountain Region. FHP Report R4-01-01. 29 p.
- Weatherspoon, P. 1988. Evaluating damage to trees from the 1987 wildfires. In: Oregon State University Extension Service Forestry Intensified Research (FIR) Report: Special Fire Issue. 9:13-14.
- Wei, X., J.P. Kimmins, and G. Zhou. 2003. Disturbances and the sustainability of long-term site productivity in lodgepole pine forests in the central interior of British Columbia - an ecosystem modeling approach. Ecological Modeling, Volume 164, Issues 203. Pages 239-256.

References Cited

Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. *J. Wildl. Manage.* 65(3):489-497.

Wemple, B. C., J.A. Jones, and G. E. Grant. 1996 Channel network extension by logging roads in two basins, Western Cascades, Oregon. *Water Resources Bulletin, American Water Resource Association.* 32 (6): 1195-1207

White, D.E., T. Atzet, P.A. Martinez and L.A. McCrimmon. 2002. Dead Wood and Fire Relationships in Southwestern Oregon Western Hemlock Forests. *In* W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). *Proceedings of the symposium on the ecology and management of dead wood in western forests*, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181:479-487.

Wilson, Larry 1999. Snagfall submodel for SNFP growth and yield model. Paper dated August 12th, 1999.

Wright, Henry A. and Arthur W. Bailey. 1982. *Fire Ecology: United States and Southern Canada*. New York: John Wiley and Sons. 501 pages.

Glossary and Acronyms

A

Access - The mode by which activities are pursued and how well users can travel to or within the setting.

Affected Environment - The biological, social, economic, and physical aspects of the environment that will or may be changed by proposed actions.

Alternative - A combination of management prescriptions applied in specific amount and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. An alternative need not substitute for another in all respects.

Anadromous fish - Those species of fish that mature in the sea and migrate into streams to spawn (e.g., salmon and steelhead trout).

Analysis Area - A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and other outputs and environmental quality objectives; and (2) economic and social impacts.

Aquatic (and riparian) health - Aquatic and riparian habitats that support animal and plant communities that can adapt to environmental changes and follow natural evolutionary and biogeographic processes. Healthy aquatic and riparian systems are resilient and recover rapidly from natural and human disturbance. They are stable and sustainable, in that they maintain their organization and autonomy over time and are resilient to stress. In a healthy aquatic/riparian system there is a high degree of connectivity from headwaters to downstream reaches, from streams to floodplains, and from subsurface to surface. Floods can spread into floodplains, and fish and wildlife populations can move freely throughout the watershed. Healthy aquatic and riparian ecosystems also maintain long-term soil productivity.

Available water - The amount of water in the soil that can be readily absorbed by plant roots.

B

Best Management Practice (BMP) - The set of practices derived from "General Water Quality Best Management Practices", USDA 1988, and listed in the Forest Plan which, when applied during implementation of a project, ensures that water-related beneficial uses are protected and that State water quality standards are met in the appropriate management areas. BMPs are based on site-specific evaluation and represent the most effective and practicable means of accomplishing the water quality goals of the specific area involved in the project.

Biological Diversity - (1) The distribution and abundance of plant and animal communities. (2) The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

Board Foot - A unit of measurement represented by a board one foot square and one inch thick.

C

Canopy - In a forest, the branches from the one or more uppermost layers of trees.

Canopy closure - The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Catastrophic/Catastrophe - As defined by Webster's, a great and sudden calamity/disaster. When used in context of the Umpqua LRMP, catastrophic events are defined as fires, windstorms, or insect and disease attacks. A catastrophic occurrence to a stand occurs when greater than 50% of an existing stand is affected.

Closure - A road management term indicating the road cannot be used by motorized traffic. This limitation can be accomplished by regulation, barricade, or blockage devices. The road can be available for emergency use or permitted use such as firewood cutting during dry periods.

Competition - An interaction that occurs when two or more individuals make demands of the same resources that are in short supply.

Connectivity - The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of a fragmented condition.

Corridor (landscape) - Landscape elements that connect similar patches of habitat through an area with different characteristics.

Cover type - A vegetation classification depicting a genus, species, group of species, or life form of tree, shrub, grass, or sedge. In effect the present vegetation of an area.

Crown - The part of a tree containing live foliage; treetops.

Cultural Resource - The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

D

Danger Tree - A standing live or dead tree, including snags, with evidence of deterioration or physical damage to the root system, trunk, or stem.

Debris Flows - Are large debris slides that are charged with water and confined to steep

stream channels. Debris flows may travel several thousand feet before settling out in gentler terrain often at the junction of the steep tributary and a larger, lower gradient stream.

DecAID - An internet-based computer program being developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use dead wood habitats. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience (Mellen et al. 2003). DecAID presents information on wildlife use based on snag density and snag diameter. This information is presented at three statistical levels: low (30% tolerance level), moderate (50% tolerance level), and high (80% tolerance level). A tolerance level can also be defined as an assurance of use. Or the likelihood that individuals in a population of a selected species will use an area given a specified snag size and density.

Decommissioned Road - A road permanently removed from the transportation system. The management objective of decommissioning is to restore the hydrologic function. Decommissioning includes, as needed: the removal of drainage structures such as culverts, recontouring cut and fill slopes, subsoiling, and revegetating the old road beds.

Density (stand) - The number of trees growing in a given area, usually expressed in terms of trees per acre or basal area per acre.

Desired Condition - (1) A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved. (2) A description of the landscape as it could reasonably be expected to appear at the end of the planning period if the plan goals, objectives, standards, and guidelines for that landscape are fully achieved.

Detrimental Soil Conditions- Are those physical changes to soil caused by equipment or traffic that results in compaction, puddling or horizontal displacement of surface soils, or severe burning where the top soil layer has been changed in structure and color (Umpqua LRMP IV-68-69).

Detrimental Soil Impacts - Soil erosion, displacement, compaction, puddling, or burning that exceeds certain thresholds. For instance, displacement is a detrimental soil impact only if more than 50% of the topsoil or humus-enriched A-horizon is removed from an area of 100 square feet or more, which is at least 5 feet in width. A Forest Plan standard limits the amount of detrimental soil impacts to 20% of an activity area.

Diameter at Breast Height (DBH) - The diameter of a tree measured 4 ½ feet above the ground.

Disturbance - Refers to events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and diseases. Human-caused disturbances include, among others, actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

Downed Wood - A tree or part of a tree that is dead and lying on the ground.

Duff - The partially decomposed organic material of the forest floor that lies beneath freshly fallen leaves, needles, twigs, stems, bark, and fruit.

E

Ecosystem - A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

Effects - Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, and cumulative effects, which includes the effects of the past, present, proposed, and reasonably foreseeable actions.

Effective Ground Cover - (EGC) is considered to be all living or dead herbaceous or wood material and rock fragments greater than $\frac{3}{4}$ inch in contact with the ground and considered to be stable and resistant to downslope movement.

Endangered Species - Any species, plant, or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Environment - The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

Environmental Impact Statement (EIS) - A document prepared by a Federal agency on the environmental effects of its proposals for major actions used as a tool for decision-making. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

Erosion - The wearing away of the land surface or stream channel by running water, wind, ice, gravity, or other geological activities; can be reduced by increasing ground cover or that concentrate running water.

F

Fire Intensity - A term used to describe the rate at which a fire produces thermal energy; influenced by the amount of fuel available, local weather conditions, and the topography of the burn site. Refers to how the fire affected the canopy. Low intensity fire = 40% of over story trees killed. Moderate intensity = 40-80 % of over story trees killed. High intensity = 80-100% of over story trees killed.

Fire Regime - The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.

Fire Return Interval - The average time between fires in a given area.

Fire Severity - The degree to which a site has been altered or the successional processes disrupted by fire. Fire severity, loosely, is a product of fire intensity and residence time.

Depending on the amount and condition of organic material in them, burned areas are described as belonging to one of three fire severity categories: *low-severity*, *moderate-severity*, or *high-severity*. Low severity = duff is largely intact, although it can be charred on the surface; woody debris is partially consumed or charred. Moderate severity = duff is deeply charred or consumed, but underlying mineral soil is not visibly altered, including fine roots near the surface. High severity = Duff is completely consumed or deeply burned. Soil surface texture is changed and fine roots near the surface are consumed or deeply burned. It is possible to have a high intensity fire with low severity. It is also possible to have a low intensity fire with high severity. Severity also considers the amount of time fire was present and how high the temperatures.

Fireline Intensity - The rate of heat release along a unit length of fireline. A high intensity fire would require additional and more complex resources (air tankers, bulldozers, etc.) to suppress than a low intensity fire.

Floodplain - The portion of river valley or level lowland next to streams, which is covered with water when the river or stream overflows its banks at flood stage.

Forage - Vegetation (both woody and non-woody) eaten by animals, especially grazing and browsing animals.

Forbs - Any herbaceous plant other than true grasses, sedges, and rushes.

Forest Health - The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity to provide for specified human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Forest Plan (Umpqua) - A document that guides natural resource management and establishes standards and guidelines for a national forest; required by the National Forest Management Act.

Forest-Wide Standards - An indication of policy or conduct dealing with the basic management of the Forest. Forest-wide management standards apply to all areas of the Forest regardless of the other management prescriptions applied.

Fragmentation (habitat) - The break-up of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.

Fuel (fire) - Dry, dead parts of trees, shrubs, and other vegetation that can burn readily.

Fuel Hazard - An accumulation of vegetative fuel that has a high risk of ignition or difficulty of suppression.

Fuel Ladder - Vegetative structures or conditions such as low-growing tree branches, shrubs, or smaller trees that allow fire to move vertically from a surface fire to a crown fire.

Fuel load - The dry weight of combustible materials per unit area; usually expressed as tons

per acre.

Fuel Treatment - The rearrangement or disposal of natural or activity fuels to reduce the fire hazard.

G

Ground fire - A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface. Synonymous with underburn.

H

Habitat - A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Habitat Type - A group of plant communities having similar habitat relationships.

Hard Snag - A snag composed primarily of sound wood, particularly sound sapwood, that is generally unmerchantable.

Harvest - (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

Headwaters - Beginning of a watershed; un-branched tributaries of a stream.

Hiding Cover - Vegetation capable of hiding 90% of a standing adult deer or elk from human view at 200 feet.

Historic or Natural Range of Variability - The natural fluctuation of ecological and physical processes and functions that would have occurred during a specified period of time. Refers to the range of conditions that are likely to have occurred prior to settlement of the project area by Euro-Americans (approximately the mid 1800s), which would have varied within certain limits over time. The range of variability is discussed in this document only as a reference point, to establish a baseline set of conditions for which sufficient scientific or historical information is available to enable comparison to current conditions.

Hydrophobic Soil - Soil that does not readily absorb water. Hydrophobic soil is highly erodible. It is usually formed during severe fire on coarse textured soils. Hydrophobic soil usually returns to a non-hydrophobic condition after one or two winters.

I

In The Clear - A position within the work area where the probability of hazardous contact with falling trees, moving logs, root wads, chunks, material, rigging and equipment is minimized by distance from the hazards and/ or use of physical barriers, such as stumps, trees, terrain or other objects providing protection.

Indicator Species - A species that is presumed to be sensitive to habitat changes; population changes of indicator species are believed to best indicate the effects of land management activities.

Interdisciplinary Team (IDT) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Intermittent Stream - A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

Irretrievable - Applies primarily to the use of nonrenewable resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a road. If the road is decommissioned, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long time periods. Irreversible also includes loss of future options.

Issue - An unresolved conflict over the use of available resources. Issues are points of debate, dispute, or disagreement over the effects of a proposed action.

L

Landing - Any designated place where logs are laid after being yarded, and are awaiting subsequent handling, loading and hauling.

Landscape - All the natural features such as hills, forest, and water, which distinguish one part of the earth's surface from another part; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

Large Downed Wood - Logs on the forest floor with a large end diameter of at least 21 inches.

Large Woody Debris - Pieces of wood that are of a large enough size to affect stream channel morphology.

Late-Successional Forest - Refers to mature forest characterized by a single or multiple canopy layers consisting of large or old trees. Other characteristics of old forests include: variability in tree size; increasing numbers of snags and coarse woody debris; increasing appearance of decadence, such as broken tops, sparse crowns, and decay in roots and stems; canopy gaps and understory patchiness; and old trees relative to the site and species.

Litter - The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits.

Low Soil Burn Severity - Low soil heating, or light ground char occurs where litter is scorched,

charred , or consumed, but the duff is left largely intact, although it can be charred on the surface. Woody debris accumulation is partially consumed or charred. Mineral soil is not changed.

M

Management Area - An area with similar management objectives and a common management prescription.

Management Direction - A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

Management Indicator Species - Species identified in the Forest Plan that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Maximum Modification - A Visual Quality Objective where land management activities can dominate the natural landscape to greater extent than in the modification objective, except as viewed from background when visual characteristics must be those of natural occurrences within the surrounding area.

Mitigation - Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action.

Modification - A Visual Quality Objective where land management activities may visually dominate the natural surrounding landscape but must borrow from naturally established form, line, color, and texture.

N

National Environmental Policy Act (NEPA) - A national policy that encourages "productive and enjoyable harmony between man and his environment." NEPA requires Federal agencies to: (a) use a systematic interdisciplinary approach in planning and decisionmaking; (b) consider the environmental impact of proposed actions; (c) identify adverse environmental effects which cannot be avoided should the proposal be implemented; (d) consider alternatives to the proposed action; (e) consider the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and (f) identify any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. Establishes a Council on Environmental Quality (CEQ).

O

Old Growth - For all National Forests in the Pacific Northwest Region, an old growth stand is defined as any stand of trees 10 acres or greater generally containing the following

characteristics:

- a) Stands contain mature and over-mature trees in the overstory and are well into the mature growth stage (see Handbook of Terminology, Society of American Foresters).
- b) Standing dead trees and down material is present.
- c) Evidence of human activities may be present but may not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

Open Road - A road or segment that is open to use.

Open Road Density - The miles of open road in a specific area of land. Commonly miles per square mile of land.

Overstory - The uppermost canopy of the forest when there is more than one level of vegetation.

P

Partial Harvest - A silvicultural practice where part of the stand is removed and part of the stand is retained. Partial harvest is defined as a logging operation that leaves a majority of the existing live or dead trees standing after harvest.

Partial Retention - A Visual Quality Objective where land management activities may be evident to the viewer but must remain visually subordinate to the surrounding landscape.

Pedestal Formation - Stones and pebbles perched on the column of soil they shield from rainfall.

pH - Stands for the "power of Hydrogen." During photosynthesis, hydrogen ions are created. More plant life in the water equates to more hydrogen ions and higher pH levels.

Prescribed Fire - Intentional use of fire under specified conditions to achieve specific management objectives.

Prescribed Natural Fire - The use of unscheduled natural ignitions to meet management objectives. Lightning is the primary cause of natural ignition.

Prescription - A management pathway to achieve a desired objective(s).

Preservation - Allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited. This objective applies to specially classified areas, including wilderness.

Primary Production - Is the growth and production of biomass by plants.

Productivity - (1) *Soil productivity*: the capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water-holding capacity and mineral, nutrient, and organic matter content). (2) *Vegetative productivity*: the rate of production of vegetation within a given period. (3) *General*: the innate capacity of an environment to support plant and animal life over time.

Proper Functioning Condition - Riparian wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses and stabilize stream banks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses, and support greater biodiversity.

Proposed Action - A proposal by a federal agency to authorize, recommend, or implement an action.

R

Record of Decision - A document separate from but associated with an Environmental Impact Statement that states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not (40 CFR 1505.2).

Reforestation - Treatments or activities that help to regenerate stands of trees after disturbances such as harvest or wildfire. Typically, reforestation activities include preparing soil, controlling competition, controlling pests, and planting seeds or seedlings.

Regeneration - The process of establishing new plant seedlings, whether by natural means or artificial measures (planting).

Rehabilitate - To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall system may not be exactly as it was before.

Resilient, Resilience, Resiliency - (1) The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic or social forces.

Restoration - Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume acting or continue to act following disturbance as if the disturbances were absent. Restoration management activities can be either active (such as control of noxious weeds, thinning of over-dense stands of trees, or redistributing roads) or more passive (more restrictive, hands-off management direction that is primarily conservation oriented).

Retention - A Visual Quality Objective where land management activities are not visually evident. Management activities are permitted, but the results of those activities on the natural landscape must not be evident to the average viewer.

Riparian Area - Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley

bottoms that support riparian vegetation.

Roads and Danger Trees - All danger trees that can be fall or slide onto roadways shall be felled a safe distance back from the roadway. Loose rocks, stumps, and other materials that obstruct the view at inspections or on sharp curves shall be cleared.

Road Density - The measure of the degree to which the length of road miles occupies a given land area (usually expressed as mile/sq. mile).

Roadless Area - A National Forest area that (1) is larger than 5,000 acres or, if smaller than 5,000 acres, is contiguous to a designated wilderness or primitive area; (2) contains no roads; and (3) has been inventoried by the Forest Service for possible inclusion in the Wilderness Preservation System.

Runoff - The total stream discharge of water, including both surface and subsurface flow, usually expressed in acre-feet of water yield.



Salmonids- Belong to the family of fish that includes salmon and trout. Some species are ocean-going (anadromous) while others are not (resident).

Salvage Harvest - The harvest of trees that are dead, dying, or deteriorating (e.g. because over-mature or materially damaged by fire, wind, insects, fungi, or other injurious agencies) before they lose their commercial value as sawtimber.

Sawtimber - Trees suitable in size and quantity for producing logs that can be processed into lumber.

Scoping - An early and important process for determining the scope of issues to be addressed and for identifying the significant issues related to the proposed action. Identifying the significant environmental issues deserving of study and de-emphasizing insignificant issues, narrowing the scope of the environmental impact statement accordingly (CEQ regulations, 40 CFR 1501.7).

Sediment - Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle out.

Sensitive Species - Those species which are recognized by the Regional Forester to need special management in order to prevent the need for their placement on Federal or State lists.

Seral - Refers to the stages that plant communities go through during succession. Developmental stages have characteristic structure and plant species composition. Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid seral in a forest would refer to pole or medium sawtimber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature and old

forest stages).

Seral Stage - The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

Shallow Soils - Highly and very highly erodible, unforested, shallow, rocky soils supporting low amounts of ground cover.

Sheet Erosion - Removal of a relatively uniform thin layer of soil from the land surface by rainfall and largely unchanneled surface runoff (sheet flow).

Silviculture - The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Site - A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested.

Slash - The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.

Slash Treatment - Includes underburning, grapple piling and burning the piles, hand piling and burning the piles, and yarding tops attached.

Snag - A standing dead tree, usually larger than five feet tall and six inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.

Soil - The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

Soil Disturbance - Disturbance, such as displacement or compaction, which may or may not be intense enough to be detrimental soil impact.

Soil- Low Burn Severity- Low soil heating, or light ground char occurs where litter is scorched, charred, or consumed, but the duff is left largely intact, although it can be charred on the surface. Woody debris accumulation are partially consumed or charred. Mineral soil is not changed.

Soil-Moderate Burn Severity- Moderate soil heating, or moderate ground char, occurs where the litter on forest sites is consumed and the duff is deeply charred or consumed, but the underlying mineral soil surface is not visibly altered. Light colored ash is present. Woody debris is mostly consumed, except for logs, which are deeply charred.

Soil-High Burn Severity - High soil heating, or deep ground char, occurs, where the duff is completely consumed and the top of the mineral soils is visibly reddish or orange on severely burned sites. Color of the soil below 1 cm is darker or charred from organic material. The char layer can extend to a depth of 10 cm or more. Logs can be consumed or deeply charred, and deep ground char can occur under slash concentrations or burned logs. Soil textures in the surface layers are changed and soil becomes fused.

Stand - A group of trees in a specific area that is sufficiently alike in composition, age,

arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

Stand Density - Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Streams (Class I and II) - Are perennial streams that have sea-run (anadromous) and resident fish, respectively.

Streams (Class III) - Are perennial streams that are not occupied by fish.

Streams (Class IV) - Intermittently flowing streams that dry up in the summer.

Stream channel - The deepest part of a stream or riverbed through which the main current of water flows.

Structure - The size and arrangement, both vertically and horizontally, of vegetation.

Subwatershed - A drainage area, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within watershed (5th-field HUC), which in turn contained within a subbasin (4th-field HUC). The size of subwatersheds has recently been redefined as 10,000 to 40,000 acres.

Surface Erosion - The detachment and transport of individual soil particles by wind, water, or gravity.

T

Temporary Road - Those roads needed only for the timber sale purchaser's use. The Forest Service and the purchaser must agree to location and clearing widths. Temporary roads are used for a single, short-term use (e.g., to haul timber from landings to Forest development) and are decommissioned after use.

Terrestrial - Pertaining to the land.

Threatened and Endangered Species (T&E) - A species or subspecies of animal or plant whose prospects of survival and reproduction are in immediate jeopardy or likely to become so within the foreseeable future. Threatened species are identified by the Secretary of Interior in accordance with the 1973 Endangered Species Act.

U

Underburn - To burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory - The trees and other woody species that grow beneath the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or shrub canopy.

Upland - The portion of the landscape above the valley floor or stream.

V

Viability - In general, viability means the ability of a population of a plant or animal species to persist for some specified time into the future. For planning purposes, a *viable population* is one that has the estimated numbers and distribution of reproductive individuals to ensure that its continued existence will be well distributed in the planning area.

Visual Quality - The degree of apparent modification of the natural landscape.

Visual Quality Objectives (VQOs) - A desired level of management based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

W

Watershed - (1) The region draining into a river, river system, or body of water. (2) Fifth-field watersheds can range in size from 40,000 to 250,000 acres and are made up of multiple 6th field watersheds. Sixth-field watersheds can range in size from 10,000 to 40,000 acres, with some as small as 3,000 acres.

Wildfire - A human or naturally caused fire that does not meet land management objectives.

Wildland Urban Interface (WUI) - The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Y

Yarding - The hauling of felled timber to the landing or temporary storage site from where trucks (usually) transport it to the mill site. Yarding methods include cable yarding, ground skidding, and aerial methods such as helicopter yarding.

Yarding with Tops Attached - Transporting the crown attached to the last log. The last log is trimmed and bucked at the landing. This is done to trees that are too large for whole tree yarding.

Key Acronyms

BAER	Burned Area Emergency Rehabilitation/Response
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CWD	Coarse Woody Debris
DBH	Diameter at Breast Height
EGC	Effective Ground Cover
EIS (DEIS or FEIS)	Environmental Impact Statement (Draft or Final)
IDT	Interdisciplinary Team
KV	Knutsen-Vandenberg
LRMP	Land and Resource Management Plan
LSR	Late Successional Reserve
MIS	Management Indicator Species
MMBF	Million Board Feet
NEPA	National Environmental Policy Act of 1969
NFMA	National Forest Management Act of 1976
NFS	National Forest System
PAG	Plant Association Group
PETS	Proposed, Endangered, Threatened, or Sensitive species
ROD	Record of Decision
SHPO	State Historic Preservation Office
SOPA	Schedule of Proposed Actions
VQO	Visual Quality Objectives
WA	Watershed Analysis
WEPP	Wildfire Effects Evaluation Project

This page intentionally left blank.

References Cited

- Adams, Clarence. Personal Communication - March 23, 2004.
- Adams, W.T., J. Zuo, J.Y. Shimizu, and J. C. Tappeiner. 1998. Impact of Alternative Regeneration Methods on Genetic Diversity in Coastal Douglas-Fir. *Forest Science*, Vol. 44, No.3, pages 390-396.
- Agee, James K. 1993. *Fire Ecology of the Pacific Northwest*. Washington, DC: Island Press. 493 p.
- Altman, B. 2000. Olive-sided flycatcher nest success and habitat relationships in post-fire and harvested forests of western Oregon. Unpublished report. 32pp.
- Altman, B. and R. Sallabanks. 2000. Olive-sided Flycatcher. *In* A. Poole and F. Gill, (eds.) *The Birds of North America*, No. 502. The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.
- Amaranthus, M. P., D. Page-Dumroese, A. Harvey, E. Cazares, and L. Bednar, 1996. Soil compaction and organic matter affect conifer seedling nonmycorrhizal and ectomycorrhizal root tip abundance and diversity, USDA Forest Service, PNW-RP-494.
- Amaranthus, M., H. Jubas, and D. Arthur. 1989. Stream shading, summer streamflow and maximum water temperature following intense wildfire in headwater streams.
- Amman, Gene D., and Kevin C. Ryan. 1991. Insect Infestation of Fire-Injured Trees in the Greater Yellowstone Area.
- Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. Gen.Tech. Rep. INT-122.
- Anthony, R.G., Forsman, E.D., Green, G.A., Witmer, G. and S.K. Nelson. 1987. Small mammal populations in riparian zones of different-aged coniferous forests. *The Murrelet* 68, 94-102.
- Anthony R., S. Ackers, R. Claremont, J. LaVoie, D. Giessler, N. Seaman, J. Schilling and S. Turner-Hane. 2002a. The ecology of northern spotted owls (*Strix occidentalis caurina*) on the Willamette National Forest, Oregon: Habitat use and demography. Annual research report. 27p.
- Anthony R., S. Andrews, F. Wagner, W. King, T. O'Brien, T. Phillips, G. Rible and M. Shannon. 2002b. Demographic characteristics of spotted owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades. Annual research report. 23p.
- Arnett, E. and J.P. Hayes. 2002. Influence of landscape characteristics on abundance and use of habitat by bat communities in the central Oregon Cascades. Cooperative Forest Ecosystem Research Program - CFER annual report. Corvallis, OR. p. 51-53.

- Aubry, K.B., M.J. Crites and S.D. West. 1991. Regional patterns of small mammal abundance and community composition of Oregon and Washington. Pages 285-94 in L. F. Ruggiero, K. B. Aubry, A. B. Carey, and M. H. Huff, tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. USDA For. Serv. Gen. Tech. Rep. PNW-285. Portland, OR.
- Aubry, K.B. and C.M. Raley. 2002. Ecological characteristics of fishers in the southern Oregon Cascade Range. Final progress report: June 2002. USDA For. Serv., Pacific Northwest Research Station, Olympia, WA.
- Aubry, K.B. and J.C. Lewis. 2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. Biological Conservation, in press.
- Barker, Paul F. 1989. Timber salvage operations and watershed resource values. In: Berg, Neil H., tech. coord. Proceedings of the symposium on fire and watershed management; 1988 October 26-28; Sacramento, CA. Gen. Tech. Rep. PSW-109. Berkeley, CA: USDA Forest Service, Pacific Southwest Forest and Range Experiment Station: 1-2. Available from: National Technical Information Service, Springfield, VA 22161; PB89-228639.
- Bate, L.J., Garton, E.O. and M.J. Wisdom. 1999. Estimating snag and large tree densities and distributions on a landscape for wildlife management. Gen. Tech. Rep. PNW-GTR-425. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.
- Bouwman, Alex F., and Rik Leemans. 1995. The Role of Forest Soils in the Global Carbon Cycle. Carbon Forms and Functions in Forest Soils. Mcfee and Kelly Editors. Copyright, Soil Science Society of America.
- Bendell, J. F. 1974. Effects of fire on birds and mammals. Pages 73-138 in T.T. Kozlowski and C.E. Ahlgren, eds. Fire and ecosystems. Academic Press, New York.
- Bennett, K.A. 1982. Report to the Siuslaw National Forest. Effects of slash burning on surface soil erosion rates in the Oregon Coast Range.
- Beschta, Robert L. 1990. Effects of fire on water quantity and quality. In: Walstad, John D., S.R. Radosevich, D.V. Sandberg, eds. Natural and prescribed fire in Pacific Northwest Forest. Corvallis, Oregon State University Press: 219-232 .
- Beschta et. al. 1995. Wildfire and Salvage Logging: Recommendations for Ecologically Sound Post Fire Salvage Management and Other Post-Fire Treatments on Federal Lands in the West.
- Bjornn, T.C. and D. W. Reiser. 1991. Habitat Requirements of Salmonids in Streams: Influences of Forest and Range Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. Bethesda, MD, USA.
- Bouwman and Leemans 1995. The Role of Forest Soils in the Global Carbon Cycle. Carbon Forms and Functions in Forest Soils. Mcfee and Kelly Editors. Copyright, Soil Science Society of America.

Brown, G. W. 1969. Predicting temperatures of small streams. *Water Resource. Res* 5 (1):68-75.

Brown, James K. 1980. Influence of harvesting and residues on fuels and fire management. In: *Proceedings, Environmental consequences of timber harvesting in Rocky Mountain coniferous forests; 1979 September 11-13; Missoula, MT. Gen. Tech. Rep. INT-90. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 417-432.*

Brown, J., Reinhardt, E., and Kramer, K. 2001. Coarse woody debris and succession in the recovering forest. *USDA Forest Service.*

Carey, A.B. 1991. The Biology of arboreal rodents in Douglas-fir forests. *USDA Forest Service Gen. Tech. Rep. PNW-GTR-276. 46pp.*

Catton, T.J.. December 2001. Personal communication on fishers.

Choromanska U. and T.H. De Luca. 2001.

Cissel, J.H., F.J. Swanson, G.E. Grant, D.H. Olson, G.V. Stanley, S.L. Garman, L.R. Ashkenas, M.G. Hunter, J.A. Kertis, J.H. Mayo, M.D. McSwain, S.G. Swetland, K.A. Swindle and D.O. Wallin. 1998. A landscape plan based on historical fire regimes for a managed forest ecosystem: the Augusta Creek study. *Gen. Tech. Rep. PNW-GTR-422. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 82pp.*

Cissel, John; ed. 2002. *Blue River Landscape Study: Landscape Management and Watershed Restoration Strategy - Version 2. Unpublished report. Available on line at: <http://www.fsl.orst.edu/ccem/brls/BRLPV2.pdf>.*

Cole, E.K., M.D. Pope and R.G. Anthony. 1997. Effects of road management on movement and survival of Roosevelt elk. *Journal of Wildlife Management* 61(4):1115-1126.

Cristy, R.E. and S.D. West. 1993. Biology of bats in Douglas-fir forests. *USDA Forest Service Gen. Tech. Rep. PNW-GTR-308. 27pp.*

Cross, S.P., H. Lauchstedt and C. Harmes. 1996. Characterizing forest roost sites of some bats of special concern occurring in Roseburg and Medford BLM Districts. *Final Report - Department of Biology. Southern Oregon State College, Ashland, OR. 47pp.*

Dambacher, J. M. 1991. Distribution, abundance, and emigration of juvenile steelhead (*Oncorhynchus mykiss*), and analysis of stream habitat in the Steamboat Creek basin, Oregon Master's thesis. *Oregon State University, Corvallis.*

Davis, Raymond J. 2003. Snag and down wood inventory of the Baked Apple Planning Area. On file at the North Umpqua Ranger District.

Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater and M.H. Reiser. 1999. Effects of helicopter noise on nesting Mexican spotted owls. *Journal of Wildlife Management.* 63: 60-76.

References Cited

Denning, Cliff, 1994, Root Strength and Tree Surcharge (Section 4F): in, David E. Hall, Michael T. Long, and Michael D. Remboldt, eds., Slope Stability Reference Guide for National Forests in the United States: U.S. Dept. Agriculture, Forest Service, Engineering Staff, Washington, DC, EM-7170-14, v. II, p. 543-548.

Dietrich, William E., and David R. Montgomery. 1998. SHALSTAB, A digital terrain model for mapping shallow landslide potential: Technical Report, National Council of the Paper Industry for Air and Stream Improvement, Corvallis, Oregon, 26p.

Duncan, Nancy. February 2003. Personal communication. Survey and Manage Mollusk Taxa Lead. p108.

Elliot, W. J., and D. E. Hall, 1997. Water Erosion Prediction Project (WEPP) forest applications. General Technical Report INT-GTR-365. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Elliot, W. J., Robicaud, P. R. and D. E. Hall, Cuhaciyan, C. O., Pierson F. B., Wohlgemuth, P. M. 2001. A Probabilistic Approach To Modeling Erosion For Spatially Varied Conditions, Presentation to American Society of Agriculture Engineers, Sacramento, California.

Emerson, Clint. June 2003. Personal communication on Apple Fire revegetation.

Everett, Richard. 1995. Letter dated August 16 to John Lowe. Review of Beschta document. 8 p. On file with: USDA Forest Service, Pacific Northwest Research Station, 1133 N. Western Ave., Wenatchee, WA 98801.

Evers, L. 2002. Addressing the issues raised in the 1995 Beschta Report on Post-fire Salvage Logging, Oregon State Office, Pacific Northwest Region, Portland, Oregon.

Farrell, T., M. Widmann and R. Davis. 1996. Report on the 1995-96 survey to determine the occurrence, distribution and habitat associations of wolverine, fisher and marten in the Umpqua National Forest. ODFW Report 95-2-04. 22pp.

FEIS. 2003. Fire effects information system database. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online: <http://www.fs.fed.us/database/feis>.

FEMAT. 1993. Forest Ecosystem Management: an ecological, economic and social assessment. Report of the Forest Ecosystem Management Team.

Finney, Mark A. 1998. FARSITE; Fire Area Simulator - Model Development and Evaluation. RMRS-RP -4. Ogden, UT; USDA Forest Service, Rocky Mountain Research Station. 47pp.

Fischer, W.C. 1980. Prescribed fire and bark beetle attack in ponderosa pin forest. Fire Management Notes. 4: 10-12.

Flanagan, P. 1996. Survival of fire-injured conifers. Fire Management Notes 56: 13-16.

Flanagan, S.A., M.J. Furniss, T.S. Ledwith, S. Thiesen, M. Love, K. Moore, J. Ory. 1998. Methods for inventory and environmental risk assessment of road drainage crossings. USDA, Forest Service. San Dimas Technology and Development Center, San Dimas, CA.

- Fontaine, B. L. 1988. An evaluation of the effectiveness of instream structures for steelhead trout rearing habitat in the Steamboat Creek basin. Master's thesis. Oregon State University, Corvallis.
- Forde, Jon D. 1983. The effect of fire on bird and small mammal communities in the grasslands of Wind Cave National Park. Masters Thesis. Michigan Technological University. Houghton, MI. 140pp.
- Forsman, E.D., E.C. Meslow and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs 87. 64 pp.
- Forsman, E.D., J. A. Reid, S.A. Graham, J.S. Mowdy and A.L. Price. 2002. Demographic characteristics of northern spotted owls (*Strix occidentalis*) on the Tyee study area, Roseburg, Oregon: 1985-2002. Annual research report. 12p.
- Franklin A.B., K.P. Burnham, G.C. White, R.J. Anthony, E.D. Forsman, C. Schwarz, J.D. Nichols and J. Hines. 1999. Range-wide status and trends in northern spotted owl populations. Status report. Colorado State University, Fort Collins, CO and Oregon State University, Corvallis, OR. 71pp.
- Furniss, M .M. 1965. Susceptibility of fire-injured Douglas-fir to bark beetle in southern Idaho. Journal of Forestry 63: 8-11.
- Furniss, R. L., and V. M. Carolin. 1977. Western forest insects. USDA Forest Service. Miscellaneous Publications No. 1339. 654 p.
- Furniss, M.J., T.S. Ledwith, M. Love, B.C. McFadin, and S.A. Flanagan. 1998. Response of road-stream crossings to large flood events in Washington, Oregon, and
- Gebert, Krista M., & Charles E. Keegan III, Sue Willits, Al Chase. 2002. Utilization of Oregon's Timber harvest and Associated Direct Economic Effects. Pacific Northwest Research Station General Technical Report ONW-GTR-52.
- Gomez, D.M. and R.G. Anthony. 1998. Small mammal abundance in riparian and upland areas of five seral stages in western Oregon. Northwest Sci. 72:293-302.
- Good, D.A. and D.B. Wake. 1992. Geographic variation and speciation in the torrent salamanders of the genus *Rhyacotriton* (Caudata: Rhyacotritonidae). Univ. California Publications in Zoology. 126:1-91
- Graham, S. A. 1925. The felled tree trunk as an ecological unit. Ecology 6(4): 397-411.
- Grifantini, Michael C.; Stuart, J.D.; Fox, L., III. 1991. Deer habitat changes following wildfire, salvage logging and reforestation, Klamath Mountains, California. In: Proceedings of the symposium on biodiversity; 1991 October 28-30; Santa Rosa, CA. [Place of publication unknown]: [publisher unknown]: 163-167. As cited in: Mclver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

References Cited

- Grinnell, J. and T.I. Storer. 1924. Animal life in the Yosemite. University of California Press, Berkeley, CA.
- Hadfield, J.S., and R.W. Magelssen. 2000. Wood changes in fire-killed eastern Washington tree species- year five progress report. USDA Forest Service Wenatchee Service Center. 34p.
- Hagar, J.C., W.C. McComb, and C.C. Chambers. 1995. Effects of forest practices on wildlife, Chapter 9 in R.L. Beschta, J.R. Boyle, C.C. Chambers [and others]. Cumulative effects of forest practices in Oregon: literature and synthesis. Prepared for Oregon Department of Forestry. Oregon State University, Corvallis, OR.
- Harrington, M.G. 1987. Ponderosa pine mortality from spring, summer, and fall crown scorching. Western Journal of Applied Forestry 2: 14-16.
- Heinemeyer, K.S. and J.L. Jones. 1994. Fisher biology and management in the western United States. USDA Forest Service and Interagency Forest Carnivore Working Group Report. 109pp
- Helvey, J.D., A.R. Tiedemann, and T.D. Anderson. 1985. Plant nutrient losses by soil erosion and mass movement after wildfire. Journal of Soil Water Conservation 40:168-173.
- Hermann, Richard K., and William W. Chilcote 1965. effect of seedbeds on germinations and survival of Douglas-fir. Oregon State University, School of Forestry, Forest Research Laboratory Research Paper 4. Corvallis. 28 pages.
- Huff, M., J. Henshaw and E. Laws. 1997. Great gray owl survey status and evaluation of guidelines for the Northwest forest plan. Available online at the following URL: <http://www.or.blm.gov/surveyandmanage/SP/Great%20Gray%20Owl/icover.htm>
- Hunter, M.G. 1998. Watershed-level patterns among stream amphibians in the Blue River watershed, West-Central Cascades of Oregon. Masters Thesis, Oregon State Univ., Corvallis, OR. 97pp.
- Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (USA) conifer forests. Conservation Biology 9(5):1041-1058.
- Isaacs, Frank. September 2003. Personal communication on bald eagles.
- Jones, J. A., and G. E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, Western Cascades, Oregon. American Geophysical Union. Water Resources Research, vol. 32 (4): 959-974.
- Jones, J. A. 2000. Hydrologic processes and peak flow discharge response to forest removal, regrowth and roads in ten small experimental basins, Western Cascades, Oregon. Water Resources Research.
- Jurgensen, M. F., A. E Harvey, R. T. Graham, D. S. Page-Dumroese, J. R. Tonn, M.J. Larsen, and T.B. Jain. 1997. Impacts of timber harvesting on soil organic matter, nitrogen, productivity and health of Inland Northwest forests. For. Sci. 43: 234-251.

- KimmeY, J.W. 1955. Rate of deterioration of fire-killed timber in California. USDA Circular No. 962. Washington, D.C. 22 p.
- KimmeY, J.W., and R.L. Furniss. 1943. Deterioration of fire-killed Douglas-fir. USDA Technical Bulletin No. 851. Washington, D.C. 61 p.
- Kimmins, J. P. 1996. Forest Ecology, A Foundation for Sustainable Management. 2nd ed. Prentice-Hall. NJ. p61.
- Kline, LeRoy. 1996. 1995 "forest health" update. Unpublished paper presented to the Oregon Board of Forestry. 5 p. Available from: <http://www.odf.state.or.us/FH/BDFOR.HTM>.
- Klock, G.O. 1975. Impacts of five post-fire salvage logging systems on soil and vegetation. J. of Soil and Water Conservation. 30(2): 78-81.
- Lancaster, S.T., S.K. Hayes and G.E. Grant. 2001. Modeling sediment and wood storage and dynamics in small mountainous watersheds. Geomorphic Process and Riverine Habitat Water Science and Application. Vol 4, pages 85-102.
- Landsberg, Johanna and A. R. Tiedemann. 2002. Fire Management. In: Dissmeyer G.E., ed. Drinking water from forest and grasslands. Gen. Tech. Rep. SRS-39 Asheville, North Carolina: Department of Agriculture, Forest Service, Southern Research Station: 124-138.
- Leonard, W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, Seattle, WA. 168pp.
- Lightcap, Scott. September 2003. Personal communication regarding the Diamond Lake Restoration Project.
- Lint J., R. Horn, F. Oliver, C. Larson, , K. Krause, M. O'Hara, M. Oleri, H. Wise, M. Irwin, K. Fukuda and P. Colvard. 2002. Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the Klamath Mountain Province of Oregon 1983-2002. Annual research report. 23p.
- Lint, Joe. 2003. Personal communication on northern spotted owls.
- Lowell, E.C., S.A. Willets, and R.L. Krahmer. 1992. Deterioration of fire-killed timber in the western United States. USDA Forest Service, Pacific Northwest Research Station General Technical Report PNW-GTR-292. 27 p.
- Lowell, Eini C., & James M. Cahill. 1996 Deterioration of Fire Killed Timber in Southern Oregon and Northern California. West. J. Appl. For. 11(4):125-131.
- Lyon, L.J, M.H. Huff, R.G. Hooper, E.S. Telfer, D.S. Schreiner and J.K. Smith (eds.). 2000. Wildland fire in ecosystems: Effects of fire on fauna. Gen. Tech. Rep. RMRS-GTR-42-vol. 1. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 83pp.
- Marcot, Bruce G., Kim Mellen, Janet L. Ohmann, Karen L. Waddell, Elizabeth A. Willhite, Bruce B. Hostetler, Susan A. Livingston, Catherine Ogden, and Tina Dreisbach. 2002. The DecAID repository: background information for DecAID, the decayed wood advisor for

managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. USDA Forest Service, Pacific Northwest Research Station and Pacific Northwest Region, Portland, Oregon.

Marshall, D.B., M.G. Hunter and A.L. Contreras, Eds. 2003. Birds of Oregon: A general reference. Oregon State University Press, Corvallis, OR 768 pp.

Martin, D.A. and J.A. Moody. 2001. Comparison of Soil Infiltration Rates in Burned and Unburned Mountainous Watersheds. *Hydrol. Process*, 15. PP 2893-2903.

McCullough, B. 1991. Final report of a cavity nesting bird study on the Mount Hood National Forest. Unpublished report. 30pp.

McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

McDade, M. H., F. J. Swanson, W. A. Mckee, J. F. Franklin, and J. Van Sickle. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. *Canadian Journal of Forest Research* 20: 326-330.

McDonald, Lee H., Alan W. Smart, Robert C. Wissmar, 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska: U. S. Environmental Protection Agency, Water Division, and Center of Streamside Studies. EPA/910/-91-001, 166 p.

McGarigal, K. 1993. Relationships between landscape structure and avian abundance patterns in the Oregon Coast Range. Ph.D. diss., Oregon State University, Corvallis, OR.

McGarigal, K. and W.C. McComb. 1995. Relationships between landscape structure and breeding birds in the Oregon Coast Range. *Ecol. Monogr.* 65(3):235-260.

Mellen, K. and A. Ager. 2002. A coarse wood dynamics model for the western Cascades. *in* W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). Proceedings of the symposium on the ecology and management of dead wood in western forests, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181:503-516.

Miller, J.M., and F.P. Keen. 1960. Biology and control of the western pine beetle: a summary of the first fifty years of research. USDA Forest Service Miscellaneous Publication No. 800. 381 p.

Montgomery, David R., Wright, Robert H., and Booth, Thom. 1991. Debris flow hazard mitigation for colluviums field swales: Bulletin of the Assoc. of Engineering Geologists, V.XXVIII, No 3, p. 303-323.

Monleon, V. J., K. Cromack Jr., and J.D. Lansberg. 1997. Short - and long term effects of prescribed underburning on nitrogen availability in ponderosa pine stands in central Oregon. *Canadian Journal of Forest Research*. 27(3): 369-378.

- Murphy, M. L., and K. V. Koski. 1989. Input and depletion of woody debris in Alaska streams and implications for streamside management. *North American Journal of Fisheries Management* 9: 427-436.
- Nussbaum, R. A., E. D. Brodie, Jr. and R. M. Storm. 1983. *Amphibians and reptiles of the Pacific Northwest*. Univ. Press of Idaho. 332pp.
- ODFW. 2003. Oregon's elk management plan. Oregon Department of Fish and Wildlife, Portland, OR. 58pp.
- Ohmann J. L., W.C. McComb and A.A. Zumrawi. 1994. Snag abundance for primary cavity-nesting birds on nonfederal forestlands in Oregon and Washington. *Wildlife Society Bulletin* 22(4):607-620.
- Oliver C. D. and B. C. Larsen. 1996. *Forest Stand Dynamics*. Wiley and Sons, Inc. New York.
- OLMIS. Oregon Labor Market Information System. (2000). Summary Covered Employment and Payroll Report, Douglas County, 2000. Oregon Employment Department. Available at WWW: <http://www.olmis.org>
- OMB A-94. Office of Management and Budget Circular No. A-94. (1992, October, revised 1999). Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. Washington, D. C: Author.
- Ormsbee, Pat. July 2002. Personal communication on bats.
- Page-Dumeroose, Deborah; Jurgenen, M; Harvey, A. 2002. Fire and Fire Suppression Impacts on Forest Soil Carbon. Rocky Mountain Research Library, (Unpublished final Report #00-JV-11222062-550).
- Park, Chris 2003. Draft, sufficiency Analysis for Stream Temperature: evaluation of the adequacy of the Northwest Forest Plan Riparian Reserves to achieve and maintain stream temperature water quality standards. U. S. Forest Service and Bureau of Land Management.
- Partners In Flight (PIF). 2000. Landbird conservation plan: Westside coniferous forests. Partners in Flight. http://community.gorge.net/natres/pif/westside_page1.html.
- Perry, D.A., R. Molina, and M.P. Amaranthus. 1987. Mycorrhizae, mycorrhizospheres, and reforestation: current knowledge and research needs. *Canadian Journal of Forest Research*. 17(8):929-940.
- Peterson, D. L. and M. J. Arbaugh. 1986. Post fire survival in Douglas-fir and lodgepole pine: comparing the effects of crown and bole damage. *Canadian Journal of Forest Research* 16:1175-1179.
- Pilliod, D.S., R.B. Bury, E.J. Hyde, C.A. Pearl and P.S. Corn. 2003. Fire and amphibians in North America. *Forest Ecology and Management*. 178(1-2): 163-181.

References Cited

- Radtke, Sherman and Rudolph V. Edwards, Jr. 1976. Soil Resources Inventory. R-6, Umpqua National Forest, Roseburg, OR.
- Robichaud, P. R. and R.E. Brown. 1999. What Happened After the Smoke Cleared: Onsite Erosion Rates After a Wildfire in Eastern Oregon. Proceeding of the Annual Summer Specialty Conference (Track 2: Wildland Hydrology), 419-426. June 30-July 2, 1999, Bozeman, MT. Herndon, VA: American Water Resources Association.
- Rothermel, Richard C. 1983. How to Predict the Spread and Intensity of Forest and Range Fires, PMS 436-1, NFES 1573, June 1983.
- Ryan, K. C. 1990. Predicting prescribed fire effects on trees in the interior West. In; M. E. Alexander, G. F. Bisgrove technical advisors. The art and science of fire management. Proceedings of the First Interior West Fire Council Annual Meeting. Forestry Canada, Northern Forestry Center. P. 148-162.
- Ryan, K. C. and W. H. Frandsen. 1991. Basal injury from smoldering fires in mature Pinus Ponderosa Laws. International Journal of Wildland Fire 1: 107-118.
- Society of American Foresters. 1996. The role of "salvage" and "sanitation" harvesting in the restoration and maintenance of healthy forests [Position paper]. Available from: Society of American Foresters web page: www.safnet.org.
- Sauer, J. R., J.E. Hines and J. Fallon. 2003. The North American breeding bird survey, results and analysis 1966 - 2002. Version 2003.1, USGS Patuxent Wildlife Research Center, Laurel, MD.
- Scott, D.W., J. Szymoniak, and V. Rockwell. 1996. Entomological concerns regarding burn characteristics and fire effects on tree species during prescribed landscape burns: burn severity guidelines and mitigation measures to minimize fire injuries. USDA Forest Service, Wallowa-Whitman National Forest. BMZ 97-1. 48 p.
- Schwendeman, T. 1981. Dust Control Study, Gallatin National Forest. USDA Forest Service Region 1.
- Schultz, Dave. (1994, November) Deterioration of Salvage Trees. *Forest Pest Management*.
- Sessions, J., R. Buckman, M. Newton, and J. Hamann. 2003. The Biscuit Fire: Management Options for Forest Regeneration, Fire and Insect Risk Reduction, and Timber Salvage. College of Forestry, Oregon State University. 63 pp.
- Sexton, Timothy O. 1994. Ecological effects of post-wildfire salvage-logging on vegetation diversity, biomass, and growth and survival of Pinus ponderosa and Purshia tridentata. Corvallis, OR: Oregon State University, Department of Rangeland Resources. 28 p. Unpublished manuscript. On file with: Department of Rangeland Resources, Strand Agriculture Hall, Oregon State University, Corvallis, OR 97331. As cited in: McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

Shakesby, Richard A.; Coelho, Celeste de O.A.; Ferreira, António D. and others. 1993. Wildfire impacts on soil erosion and hydrology in wet Mediterranean forest, Portugal. *International Journal of Wildland Fire*. 3(2): 95-110. As cited in: McIver, James D. and Lynn Starr. Tech eds. 2000. Environmental effects of post-fire logging: literature review and annotated bibliography. Gen. Tech. Rep. PNW-GTR-486. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72p.

Sidle, Roy, 1985, Factors influencing the stability of slopes; in *Proceedings of a Workshop on Slope Stability, Problems and Solutions in Forest Management*: U.S Dept. of Agriculture, Forest Service, General Technical Report PNW-180, p. 17-25

Simon, Jerry, Stephen Christy, and Joseph Vessels. 1994. Clover-Mist fire recovery: a forest management response. *Journal of Forestry*. November: 41-44.

Siskiyou National Forest, 1997. Unpublished report Soil Disturbances from Helicopter Yarding in the Upper Pistol Timber Sale. Southwestern Oregon.

Sonoran, Institute. 2003. Population, Employment, Earnings and Personal Income Trends, Douglas County, OR. Sonoran Institute, Bozeman, Montana.

Spetler, Henry. 2002. Sawmill Closures, Openings, and Net Capacity Changes in the Softwood Lumber Sector, 1996-2003. Res. Pap. FPL-RP-603. Madison, WI: USDA, Forest Service, Forest Products Laboratory.

Spies, Thomas A.; Franklin, Jerry F. 1988. Old growth and forest dynamics in the Douglas-fir region of western Oregon and Washington. *Natural Areas Journal*. 8(3): 190-201. [7248].

Stevenson, Dwayne & Mark Miller, Kathi Riddell. 2001. Employment Projections by Occupation 2000-2010, region 6 (Douglas County). Oregon Employment Department, Salem, OR.

Swanston, Douglas N., and Frederick J. Swanson, 1976. Timber harvesting, mass erosion and steep land forest geomorphology in the Pacific Northwest: in Coates, Donald R., ed., *Geomorphology and Engineering*, Dowden, Hutchison & Ross, Inc. Stroudsburg, PA., p. 199-221.

Swezy, D. M. and J. K. Agee. 1990. Prescribed fire effects on fire fine roots and tree mortality in old-growth ponderosa pine. *Canadian Journal of Forest Research* 21:626-634.

Thomas, J.W. 2002. Dead wood: Foresters bane to environmental boon. In W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). *Proceedings of the symposium on the ecology and management of dead wood in western forests*, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181. p. 3-9

Thomas, T. L., and J. K. Agee., 1986. Prescribed fire effects on mixed conifer forest structure at Crater Lake, Oregon. *Canadian Journal of Forest Research* 16:1082-1087.

Toweill D. and J. W. Thomas (eds.). 2002. North American elk: ecology and management. Second edition. Smithsonian Institution Press. 1128pp.

References Cited

USDA Forest Service. 1975. Region 6 dead tree (snag) management policy. USDA Forest Service Manual 2405.14, Portland, OR.

USDA Forest Service. 1990. Umpqua National Forest Land and Resource Management Plan. Final Environmental Impact Statement and Record of Decision.

USDA Forest Service. 1994. American marten, fisher, lynx and wolverine in the western United States. USDA Forest Service, General Tech. Report RM-254, Rocky Mountain Research Station, Fort Collins, CO. 184pp.

USDA Forest Service. 1997. Idaho Panhandle National Forest, Sand Point Ranger District. Water Quality Effects of Three Dust Abatement Compounds.

USDA Forest Service. 1999. San Dimas Technology and Development Center. Dust Palliative Selection and Application Guide.

USDA Forest Service. 1999. Umpqua National Forest peregrine falcon site management plan. Working draft. Umpqua National Forest, Roseburg, OR. 49pp

USDA Forest Service. 2000. Landbird strategic plan. Washington, DC. 21pp.

USDA, Forest Service. 2001. Middle North Umpqua Watershed Analysis. Umpqua National Forest.

USDA Forest Service. 2001a. Watershed Analysis: North Umpqua River Wild and Scenic Corridor. North Umpqua Ranger District.

USDA Forest Service. 2002. Burned Area Emergency Response (BAER) report for the 2002 Apple Fire.

USDA Forest Service. 2003. Umpqua National Forest. Wildfire Effects Evaluation Project.

USDA Forest Service. 2003a. Umpqua National Forest. Baked Apple Roads Analysis. North Umpqua Ranger District.

USDA Forest Service, USDA Bureau of Land Management, and Oregon State Parks and Recreation Department. 1992. North Umpqua Wild and Scenic River. Environmental Assessment.

USDA/USDI, 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and its Amendments.

USDA Forest Service, USDI Bureau of Land Management. 1994. Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, Appendix J2 - Results of additional species analysis. Portland, Oregon. 475pp.

USDA Forest Service, USDI Bureau of Land Management. 1995. Great gray owl survey protocol. Portland, OR. 26 pp.

- USDA Forest Service, USDI Bureau of Land Management. 2000. Management recommendations for the Oregon red tree vole (*Arborimus longicaudus*). Version 2.0. Portland, Oregon. 25pp.
- USDA Forest Service, USDI Bureau of Land Management. 2001. Record of decision for amendments to the survey and manage, protection buffer and other mitigation measures standards and guidelines. Portland, Oregon. 106pp.
- USDA Forest Service, USDI Bureau of Land Management. 2003. Supplemental direction for identification of non-high priority sites for red tree vole within the "Pilot" Area. USDA Forest Service memorandum, BLM Instruction Memorandum OR-2003-062.
- USDA Forest Service, USDI Bureau of Land Management and U.S. Fish and Wildlife Service, 1998. South cascades late successional reserve assessment. Umpqua National Forest, Roseburg, OR. 255pp.
- USDI Bureau of Land Management. 1999. Field guide to survey and manage terrestrial mollusk species from the Northwest Forest Plan. USDI Bureau of Land Management, Portland, OR. 114pp.
- USDI Fish and Wildlife Service. 1982. Recovery plan for peregrine falcon (Pacific population). Portland, Oregon. 87pp.
- USDI Fish and Wildlife Service. 2000. 12-Month finding for a petition to list the southern torrent salamander. Federal register 65(109):35951-35956.
- USGS - United States Geological Survey. 1996. Water quality and algal conditions in the North Umpqua River Basin, Oregon, 1992-95, and implications for resource management.
- Verts, B.J. and L.N. Carraway. 1998. Land mammals of Oregon. Univ. of California Press, Berkley, CA. 800pp.
- Vesely, D. 1997. Terrestrial amphibian abundance and species richness in headwater riparian buffer strips, Oregon Coast Range. Master's thesis. Oregon State University, Corvallis.
- Weatherby, J.C., R.A. Progar, and P.J. Mocettini. 2001. Evaluation of tree survival on the Payette National Forest 1995-1999. USDA Forest Service, Intermountain Region. FHP Report R4-01-01. 29 p.
- Weatherspoon, P. 1988. Evaluating damage to trees from the 1987 wildfires. In: Oregon State University Extension Service Forestry Intensified Research (FIR) Report: Special Fire Issue. 9:13-14.
- Wei, X., J.P. Kimmins, and G. Zhou. 2003. Disturbances and the sustainability of long-term site productivity in lodgepole pine forests in the central interior of British Columbia - an ecosystem modeling approach. Ecological Modeling, Volume 164, Issues 203. Pages 239-256.

References Cited

Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. *J. Wildl. Manage.* 65(3):489-497.

Wemple, B. C., J.A. Jones, and G. E. Grant. 1996 Channel network extension by logging roads in two basins, Western Cascades, Oregon. *Water Resources Bulletin, American Water Resource Association.* 32 (6): 1195-1207

White, D.E., T. Atzet, P.A. Martinez and L.A. McCrimmon. 2002. Dead Wood and Fire Relationships in Southwestern Oregon Western Hemlock Forests. *In* W. F. Laudenslayer, Jr., P.J. Shea, B.E. Valentine, C.P. Weatherspoon and T.E. Lisle (Ed.). *Proceedings of the symposium on the ecology and management of dead wood in western forests*, 2-4 November 1999, Reno, Nevada. USDA Forest Service, Pacific Southwest Research Station General Technical Report PSW-GTR-181:479-487.

Wilson, Larry 1999. Snagfall submodel for SNFP growth and yield model. Paper dated August 12th, 1999.

Wright, Henry A. and Arthur W. Bailey. 1982. *Fire Ecology: United States and Southern Canada*. New York: John Wiley and Sons. 501 pages.