United States
Department of
Agriculture

Forest
Service

March 2008

R5-MB-162

Final Environmental Impact Statement

Mt. Ashland Late-Successional Reserve Habitat Restoration and Fuels Reduction Project

Oak Knoll Ranger District, Klamath National Forest
Siskiyou County, California and Jackson County, Oregon

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Mt. Ashland Late-Successional Reserve
Habitat Restoration and Fuels Reduction Project
Final Environmental Impact Statement
Siskiyou County, California and Jackson County, Oregon

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Abstract: This Final Environmental Impact Statement (FEIS) considers five alternatives in detail. Alternative 1 is the No Action Alternative. Alternative 2 (the Proposed Action) proposes 2,997 acres of habitat restoration treatments, 1,286 acres of treatments to develop defensible fuel profile zones (DFPZs), 4,706 acres of fuels treatment to reduce activity and natural fuels, and 6.86 miles of temporary spur roads. Alternative 4 proposes 2,487 acres of habitat restoration treatments, 1,275 acres of treatments to develop DFPZs, 4,185 acres of fuels treatment to reduce activity and natural fuels, and 4.96 miles of temporary spur roads. Alternative 5 proposes 2,987 acres of habitat restoration treatments, 1,202 acres of treatments to develop DFPZs, 4,612 acres of fuels treatment to reduce activity and natural fuels, and 2.27 miles of temporary spur roads. The Preferred Alternative proposes 2,951 acres of habitat restoration treatments, 1,058 acres of treatments to develop DFPZs, 5,765 acres of fuels treatment to reduce activity and natural fuels, and 1.70 miles of temporary spur roads.

Agency and public reviewers have provided the Forest Service with their comments during the review period of the Draft Environmental Impact Statement (DEIS). The Response to Comments is documented in Appendix H of this report. Comments received on the DEIS resulted in modifications to project descriptions and the analyses. A fifth alternative, the Preferred Alternative, was added as a result public comment on the DEIS and subsequent alternative development.

SUMMARY

In the Draft Environmental Impact Statement (DEIS) for the Mt. Ashland Late Successional Reserve (LSR) Project the Klamath National Forest (KNF) proposed 2,589 acres of habitat restoration treatments, 1,286 acres of treatments to develop defensible fuel profile zones (DFPZs), and 5,129 acres of treatments to reduce fuels. The Preferred Alternative within this Final Environmental Impact Statement (FEIS) was developed as a result of response to public and agency comment. The Project Area is approximately 13,939 acres; 80% is located in Oregon and 20% is in California.

This action is needed to promote and maintain late-successional habitat. The purpose of the project is to reduce the threat of high-severity wildfire and restore habitat for Threatened species. Historically, the general fire regime within the Klamath Mountains Bioregion (northwestern California and southwestern Oregon) was frequent, low- to moderate-intensity fire. Under this regime, stands were generally open and the landscape was characterized by a mosaic of successional stages and a high degree of spatial complexity due to the creation of openings of variable size within the forest matrix (Taylor and Skinner 1998; Taylor and Skinner 2003). Fire severity patterns were influenced by aspect and slope position. Fires were generally less severe on lower slopes, particularly north and east aspects. Fires occurring on the upper slopes tended to have more high severity burned area, particularly on south and west aspects (*ibid*.). The cumulative effect of the variation in fire severity across the slopes suggests that forested stands with late-successional characteristics (e.g., multi-layered canopy, high density of large diameter trees, snags and downed logs) were more commonly found at lower slope positions as well as north and east facing slopes.

As fire occurrence in the Klamath Mountains has declined (Skinner et al. 2006) changes in landscape patterns have become evident. Today forests are generally denser, have a greater concentration of fuels, have a higher incidence of shade-tolerant species, and are less spatially complex; the size and total acres of forest openings is declining (Skinner 1995; Taylor and Skinner 2003; Skinner et al. 2006). Effects of recent high-severity burns appear to be different than historic patterns with more area burning at high intensity (Skinner et al. 2006). This pattern suggests that late-successional habitat is less sustainable than it was historically. Proposed treatments will change stand structure to more closely resemble historic conditions, thereby increasing the sustainability of late-successional habitat in the Project Area.

The Mt. Ashland LSR forested landscape is currently deficient in the amount of desired late-successional habitat. Approximately 30% of the Mt. Ashland LSR is in a late-successional forest condition. Existing late-successional habitat in the south zone of the LSR is mainly in small patches, and only a few drainages, such as Upper Cow Creek, contain larger blocks. Guidance from the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) and the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) suggests that the Mt. Ashland LSR is approximately 50% below the desired amount of late-successional habitat.

This planning effort has been ongoing for three and a half years, and information has been provided to the public in a variety of ways. Notice of the proposal first appeared in the July 2004 Schedule of Proposed Actions for the KNF. A public field trip was held September 29th, 2004. A scoping letter was mailed to 33 interested individuals and groups on October 3, 2005, and a Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register on October 7, 2005. Additional meetings and/or field trips with the public occurred on October 28 and 29, 2005, November 16, 2006, and January 10, 2007.

Federally recognized tribes consulted include the Karuk Tribe of California, the Quartz Valley Reservation, the Yurok Tribe, and the Hoopa Tribe. The United States Fish and Wildlife Service, the National Marine Fisheries Service, Environmental Protection Agency, and the North Coast Water Quality Control Board were consulted during the planning process.

Two issues were identified as significant for this project: spur road construction effects on habitat and cumulative watershed effects. Based on these issues, two new alternatives were developed and analyzed in addition to the No Action and Proposed Action alternatives in the DEIS. A fifth alternative, the Preferred Alternative, was added in response to public comment on the DEIS. In order to meet project objectives, under all alternatives large trees (greater than 20") will be retained to the extent possible. Alternatives analyzed in this document include:

- **Alternative 1: No Action**

- **Alternative 2 (Proposed Action):** This alternative would treat 4,706 acres in 258 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,589 acres and small diameter thinning for trees ≤9" on 408 acres. The DFPZs would be created by using variable density thinning on trees >9" on 1,286 acres. Ground-based yarding systems would be used on 1,202 acres, skyline systems on 1,602 acres, and helicopter yarding would be used on 1,071 acres. Underburning would occur on 1,502 acres and mastication would occur on 809 acres. Thinning of small trees and burning would occur on 303 acres within Riparian Reserves. Spur road construction would include 6.86 miles of new temporary road. For existing roads used during project implementation: four unauthorized roads will be added to the system (2.43 miles), six open road segments will be changed to year-round closure (9.3 miles), 0.49 mile of system road will be decommissioned, and 22 unauthorized road segments will be hydrologically stabilized and closed (8 miles).

- **Alternative 4:** This alternative differs from Alternative 2 by reducing acres treated, reducing the use of ground-based yarding systems, and the construction of temporary spur roads. This alternative would treat 4,185 acres in 217 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,079 acres and small diameter thinning for trees ≤9" on 408 acres. The DFPZs would be created by using variable density thinning on trees >9" on 1,275 acres. Ground-based systems would be used on 965 acres, skyline systems on 1,528 acres, and helicopter yarding would be used on 861 acres. Underburning would occur on 1,438 acres and mastication would occur on 617 acres. Spur road construction would include 4.96 miles of new temporary road with six fewer roads and six fewer landings than Alternative 2. For

existing roads used during project implementation: four unauthorized roads will be added to the system (2.43 miles), six open road segments will be changed to year-round closure (9.3 miles), 0.49 mile of system road will be decommissioned, and 16 unauthorized road segments will be hydrologically stabilized and closed (4.54 miles).

- **Alternative 5:** This alternative differs from Alternative 2 by reducing acres treated, reducing the use of ground-based systems, reducing the use of mastication equipment, increasing the use of helicopter yarding, and minimizing the construction of temporary spur roads. This alternative would treat 4,612 acres in 258 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,579 acres and small diameter thinning for trees ≤9" on 408 acres. The DFPZs would be created by using variable density thinning on trees >9" on 1,202 acres. Ground-based systems would be used on 1,065 acres, skyline systems on 1,471 acres, and helicopter yarding would be used on 1,245 acres. Underburning would occur on 1,536 acres and mastication would occur on 745 acres. Spur road construction would include 2.27 miles of new temporary road with 13 fewer roads and nine fewer landings than Alternative 2. For existing roads used during project implementation: four unauthorized roads will be added to the system (2.43 miles), six open road segments will be changed to year-round closure (9.3 miles), 0.49 mile of system road will be decommissioned, and 19 unauthorized road segments will be hydrologically stabilized and closed (6.94 miles).

- **Preferred Alternative:** This alternative differs from Alternative 2 by reducing the acres treated, reducing the use of ground-based systems, the construction of temporary spur roads, and the use of helicopter logging. Increases occur in the use of fuels treatment to reduce ground and ladder fuels, the use of underburning, and the use of cable yarding. This alternative would treat 4,468 acres in 247 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,543 acres and small diameter thinning for trees ≤9" on 408 acres. The DFPZs would be created by using variable density thinning on trees >9" on 1,058 acres. Ground-based systems would be used on 1,056 acres, skyline systems on 1,610 acres, and helicopter yarding would be used on 935 acres. Underburning would occur on 3,747 acres and mastication would occur on 1,037 acres. Spur road construction would include 1.70 miles of new temporary road with 14 fewer roads and four more landings than Alternative 2. For existing roads used during project implementation: four unauthorized roads will be added to the system (2.43 miles), six open road segments will be changed to year-round closure (9.3 miles), 0.49 mile of system road will be decommissioned, and 24 unauthorized road segments will be hydrologically stabilized and closed (8.63 miles).

Based upon the effects of the alternatives, the responsible official will decide on the following main points:

- Whether or not to implement habitat restoration treatments
- Whether or not to provide fuels treatments to create DFPZs
- Whether or not to implement treatment of activity fuels (fuel created through vegetation treatment) or natural fuels
- Whether or not to construct temporary spur roads to implement above activities.

In addition to deciding whether or not the above activities occur, the responsible official would also choose the degree to which (if at all) they are implemented.

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ACRONYMS

AWWC	Areas With Watershed Concerns
BA	Basal Area (ft^2 per acre)
BLM	Bureau of Land Management
CDF	California Department of Forestry
CHU	Critical Habitat Unit
DBH	diameter at breast height
DEIS	Draft Environmental Impact Statement
DFPZ	Defensible Fuel Profile Zone
DMR	Hawksworth dwarf mistletoe rating
DWD	downed woody debris
ERA	Equivalent Roaded Areas
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FVS	Forest Vegetation Simulator Model
FVS-FFE	Fire and Fuels Extension to FVS
GIS	geographic information system
LRMP	Klamath National Forest Land and Resource Management Plan
LSR	Late Successional Reserve
KNF	Klamath National Forest
NEPA	National Environmental Policy Act
NSO	northern spotted owl
NWFP	Northwest Forest Plan
ODF	Oregon Department of Forestry
RAWS	remote automated weather station
ROD	Record of Decision
SDI	stand density index
THP	timber harvest plan
USLE	Universal Soil Loss Equation
USFS	USDA Forest Service
USFWS	USDI Fish and Wildlife Service
VDDT	Vegetation Dynamics Development Tool

1. PURPOSE OF AND NEED FOR ACTION

The Klamath National Forest (KNF), in cooperation with the U.S. Fish and Wildlife Service (USFWS), is proposing a habitat restoration and fuels reduction project in the Mt. Ashland Late-successional Reserve (LSR) located in the Beaver Creek Watershed on the Oak Knoll Ranger District (refer to Map 1 in Appendix A – Vicinity Map).

1.1 Introduction

The Mt. Ashland LSR is approximately 51,512 acres in size and is split by a major ridge (Siskiyou Crest) into two zones, north and south. The north zone is located on the Rogue-Siskiyou National Forest and the south zone is located on the KNF. The Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project Area (Project Area) is located in the south zone and represents 27% of the LSR (refer to Map 2). Approximately 80% of the Project Area is located in Oregon and 20% in California. The majority of the Project Area occurs within two 7th field subwatersheds, Beaver-Grouse and Long John creeks, which are both located within the Beaver Creek 5th field watershed.

Approximately 30% of the Mt. Ashland LSR provides late-successional forest habitat (refer to Map 3). Both the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) and the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) suggest that about 60%–65% of the LSR should be comprised of late-successional forest habitat. This places the LSR at approximately 50% below the desired amount of habitat. Development of late-successional forest characteristics is expected to be accelerated by silvicultural treatments because many of the stands within the LSR are young and vigorous enough to respond favorably to thinning (density reduction). Extensive early logging and years of fire exclusion have resulted in dense second-growth stands at risk of mortality due to overcrowding, pests, and disease; these processes in turn elevate the risk of wildland fire which would compromise the ability of the area to meet desired future conditions for the LSR.

The purpose of the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project is to meet the following objectives: (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-successional forest related species including the Threatened northern spotted owl *(Strix occidentalis caurina)* (NSO). The objectives of this proposed project follow guidance from the following: Record of Decision (ROD) for *Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (NWFP) (USDA Forest Service and USDI Bureau of Land Management 1994a), the *Klamath National Forest Land and Resource Management Plan* (LRMP) (USDA Forest Service 1995a), the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a), the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest

Service 1999), and the *Draft Recovery Plan for the Northern Spotted Owl* (USDI Fish and Wildlife Service 1992a).

A complete description of the Proposed Action is included in Chapter 2 of this FEIS. This project is authorized under the Healthy Forest Restoration Act of 2003 (HFRA) as defined below:

- This project lies within National Forest System Lands and is in an area identified as being important for Threatened species. Habitat used by Threatened species is at risk of loss due to wildfire (Sec. 102 (a)(5));
- The project would provide enhanced protection from catastrophic wildfire for Threatened species and their habitats (Sec. 102 (a)(5)(B));
- This project complies with the Northwest Forest Plan (NWFP) (USDA Forest Service and USDI Bureau of Land Management 1994a, 1994b) which is regarded as the federal contribution to the recovery of the NSO. The project is consistent with the Final Rule determining Critical Habitat for the Northern Spotted Owl (January 15, 1992) (Sec. 102 (a)(5)(C));
- This project is consistent with the LRMP, as amended (Sec. 102 (b)). This project is not located (a) within a component of the National Wilderness Preservation System, (b) on Federal land on which the removal of vegetation is prohibited or restricted by Act of Congress or Presidential proclamation or (c) within a Wilderness Study Area (Sec. 102 (d));
- This project is consistent with section 102(e)(2) of the HFRA and is designed to "fully maintain, or contribute toward the restoration of the structure and composition of old growth stands according to the pre-fire suppression old-growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old growth structure";
- The Proposed Action was developed to focus on small diameter trees, thinning, strategic fuel breaks (DFPZs), and prescribed fire to modify fire behavior and maximize the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands (Sec. 102(f)).

1.2 Document Structure

The USDA Forest Service (USFS) has prepared this FEIS in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and alternatives. The document is organized into four chapters and a number of appendices:

- Chapter 1. Purpose of and Need for Action: This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. A brief project description is included within this section. The decisions to be made, management direction under the LRMP, collaboration and public involvement, and issues are discussed.
- Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's Proposed Action as well as alternative methods considered for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other

agencies. This discussion also includes conservation measures. Finally, this section provides a summary table that compares how well the alternatives meet the purpose and need.

- Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the baseline conditions for each resource area and describes the environmental effects of implementing the Proposed Action and other alternatives, organized by resource areas.
- List of Preparers: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- Literature Cited: This section contains bibliographical information for the literature cited throughout the document and appendices.
- Index: The index provides page numbers by document topic.
- Glossary: This section contains definitions of the more technical terms used in the document.
- Appendices: The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- Appendix A: Maps–This set of maps shows the vicinity of the project within the Klamath Basin, within the KNF area, and detailed maps for each alternative.
- Appendix B: Cumulative Effects Summary
- Appendix C: Management Opportunities Related To The Mt. Ashland LSR Habitat Restoration And Fuels Reduction Project
- Appendix D: Best Management Practices
- Appendix E: Scenery Design Standards
- Appendix F: Social Background
- Appendix G: Non-significant Issues–Disposition of Scoping Comments
- Appendix H: Public Comment Report–This section reports comments on the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project DEIS and KNF responses to them.

Additional documentation, including more detailed analyses of Project Area resources, may be found in the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project planning record located at the KNF Supervisor's Office in Yreka, California.

1.3 Changes Between Draft and Final Document

Changes have occurred between the DEIS and this FEIS. Key changes are discussed in this section. Not all changes in the document are included in this section as small changes in Project Area descriptions and alternatives can result in incremental changes affecting all resource analyses;

changes in resource analyses are found throughout this FEIS. Those changes having the most bearing on project direction are included in this section. Reasons for project changes include better data obtained through additional field survey and analysis and response to public comment.

In response to public comment and refinements in KNF analyses, an additional alternative (the Preferred Alternative) was developed. The Preferred Alternative is described in detail in Section 2.2.5 on p. 2-11. The effects of the Preferred Alternative have been analyzed and are disclosed in Chapter 3.

Project descriptions common to all action alternatives have changed, including:

- Whole tree or tops-attached cable and helicopter yarding will be used to the extent possible in order to reduce activity fuels
- Within true fir stands red fir will be favored for retention
- Landing T9 was moved from the streamside location to the opposite side of Road 40S15 (T41S R1E Section 6 NW ¼)
- There will be no temporary spur road construction across streams within Riparian Reserves. Field verification in 2007 determined that none of the proposed spur roads cross streams or riparian areas. The only exception is spur road T401, proposed in alternatives 2 and 4, which enters a Riparian Reserve running parallel to a stream.

Conservation measures common to all action alternatives have been augmented and modified. New conservation measures are described in Section 2.3.2 starting on p. 2-22, and include:

- Snag Dependent MIS – On DFPZs, large snags (>20") and groups of large snags will be retained unless hazardous to operations. If large snags (cull logs) need to be felled for safety reasons, they will be retained on site for large coarse woody debris.
- Large Tree Character – During temporary spur road construction, if any trees over 24" need to be felled, they will be left on site for coarse woody debris. To the extent possible, existing openings or corridors will be used for skyline yarding to minimize removal of large trees.
- Treatments using a masticator will be limited to <35% slopes (not <45% as previously stated)
- Several other changes to conservation measures related to soils, public safety, Riparian Reserves, and heritage resources are found in Section 2.3.2.

Project Area boundaries and acreages have been field verified between DEIS and FEIS. The project boundary was adjusted at the southern end using Deer Creek as the defining topographic feature (rather than a mid-slope line) so that underburning as the fuels treatment (all alternatives) could be more effectively applied to the DFPZ. The Project Area is approximately 13,939 acres.

1.4 Background

The Project Area is located within the Mt. Ashland LSR. LSR is a land allocation established in the NWFP (USDA Forest Service and USDI Bureau of Land Management 1994a, 1994b) and incorporated into the KNF LRMP (USDA Forest Service 1995a). LSRs, in combination with other allocations and associated Standards and Guidelines, were established to maintain a functional, interactive, late-successional and old-growth forest ecosystem. They were designed to serve as habitat for late-successional and old-growth related species including the NSO. Specifically, the Mt. Ashland LSR is expected to provide intra- and inter-provincial connectivity and support up to 20 NSO pairs over time.

The Mt. Ashland LSR is within the California Klamath Province, an area highlighted in the NWFP where fire suppression and subsequent invasion of shade-tolerant species has resulted in dense, multistoried stands with significant increases in accumulated fuels; this has caused the area to become more vulnerable to insects, disease, and stand-replacing fires.

The *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) presents a management strategy for attainment of LSR goals and objectives. Upon completion of the *KNF Forest-wide Late Successional Reserve Assessment*, the USFWS-Yreka Field Office and the KNF (Forest) recognized the need to enhance late-successional conditions within LSRs. An interagency (USFWS/Forest) team was convened in 2004 to assess restoration and fuels reduction needs within LSRs. As a result of the assessment (Westside LSR Team 2004), the Mt. Ashland LSR was identified as a high priority for treatment and is the third cooperative LSR project on the Forest. Management (treatment) opportunities for restoration and enhancement of the LSR were presented in both the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) and the *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b); opportunities described in those documents that are proposed for this project are listed in Appendix C.

1.4.1 History

A large portion of the Beaver Creek watershed was in private ownership in the late-1800s and early 1900s. During construction of the railroad in the 1800s, the Southern Pacific Railroad Company was deeded every other section of land within 36 miles of the railroad by the Federal Government, resulting in a checkerboard pattern of ownership (USDA Forest Service 1996b). In the late 1800s, Southern Pacific Railroad sold the land to small sawmills or timber companies, including land within the Project Area (ibid.). Beginning in 1932, several land exchanges between private landowners and the USFS occurred, resulting in the majority of the Project Area being acquired by the KNF. The land acquired by the USFS was logged between approximately 1910 and 1932 during the railroad logging era (ibid.); it has been estimated that railroad logging removed over 90% of the trees from the original stands (Varak 2007). Regeneration of stands after railroad logging, subsequent logging

by the Forest Service, effective fire suppression since the 1940s, and site productivity are the principal factors responsible for the current condition of forests in the Project Area.

Historically, ponderosa pine and sugar pine dominated stands on south and west aspects, comprising up to 60% of the conifers in these stands. Douglas-fir was primarily found on the lower third of slopes on these aspects. North and east aspects were dominated by Douglas-fir and white fir with true fir communities occupying the higher elevation areas. During the early years of logging, pines were the most sought-after species and large pines were almost completely removed from areas accessible to railroad and steam-donkey logging. After the harvestable pines were depleted, Douglas-fir and true fir were harvested (USDA Forest Service 1996b). Tractor and cable logging in the 1960s through the late 1980s removed many of the remaining larger trees and created some even-aged conifer plantations.

In the past, fires were common in the Klamath and Siskiyou mountains. Lightning was the primary ignition source. In addition, it is generally accepted that Native Americans used fire as a tool to manage resources in the vicinity of the Project Area, although there is little written documentation to support that claim. The Klamath River Band of the Shasta Tribe lived in the area and most likely used fire to thin vegetation and to improve hunting and gathering opportunities (Cook-Slette pers. comm.). A fire history study was conducted on Thompson Ridge (roughly 35 air miles to the west of the Project Area) in forest types similar to what is found in the Project Area and determined that prior to European settlement, the median fire return interval (the number of years between two successive fire events in a given area), was 14.5 years (range 12–19 years) and the average burn area for a fire was 860 acres (Taylor and Skinner 1998). Median fire return intervals indicate that fire was an important process affecting late-successional stand development in Klamath Mountain forests.

Similar results were found in the Hayfork study area roughly 75 air miles to the south (Taylor and Skinner 2003). Fires burned with variable severity across the landscape, killing few trees in some stands and many trees in others. Fire severity patterns were strongly influenced by aspect and slope position. Fires were generally less severe on lower slopes, particularly north and east aspects. Fires occurring on the upper slopes tended to have more high severity area, particularly on south and west aspects (Taylor and Skinner 1998, 2003). The variation in fire severity across the slopes suggests that forests with late-successional characteristics, such as multi-layered canopy, high density of large diameter trees, snags and downed logs, were more commonly found at lower slope positions and on north and east facing slopes. The upper slopes and middle slopes on south and west facing aspects were more likely to have a pattern of scattered older trees and remnant patches of older trees mixed in with larger areas of younger trees where fires had previously burned at intensities severe enough to kill many of the trees in the stand (Taylor and Skinner 1998).

1.4.2 Current Condition

Conifer species composition and stand structure have been dramatically altered as a result of fire suppression and historic logging practices. Most of the Project Area is inconsistent with, and continues to trend away from, historic vegetation conditions that are more ecologically sustainable. Eighty-three percent of the Project Area is either moderately or severely departed from historic conditions (Creasy et al. 2006), containing an excess of dense stands of smaller trees and accumulations of highly flammable forest woody debris. Currently, the Project Area is dominated by Douglas-fir and white fir at mid-elevations and true fir above 5,000' in elevation. White fir is more abundant at mid-elevations and occupies more lower-elevation sites than historically. Many of the stands on south and west aspects historically dominated by pine currently contain a mix of conifer species and are often dominated by fir species. Species composition in the area occupied by true fir (higher elevations) is not markedly different from historic conditions; however, many of these stands are more densely stocked and contain heavier fuel loads as a result of fire suppression.

Most of the area harvested during the railroad logging era has regenerated naturally and is dominated by dense stands in an early or mid-successional forest stage. Generally, these stands lack large, complex vertical and horizontal structure (large diameter trees, especially those with deformities or cavities; large branches; large diameter standing dead trees and logs on the ground; multi-storied canopies; etc.) and thus do not provide habitat for late-successional forest associated species. Approximately 55% of the LSR is in an early forest stage (stands averaging <10" diameter at breast height [DBH]) or a mid-successional forest stage (stands averaging 11"–24" DBH), including the majority of the Project Area. Within early and mid-successional stands in the Project Area, the composition of tree species has changed over the last century as a result of selective logging and fire suppression.

The Mt. Ashland LSR is deficient in the amount of desired late-successional habitat. Currently, approximately 30% of the Mt. Ashland LSR is in a late-successional forest condition. According to the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999), it is expected that eastern LSRs such as Mt. Ashland should have 45%–65% of the capable ground in late-successional habitat at any given time (ibid.), the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) suggests that 60%–75% of the LSR should be maintained in a late-successional condition. Although the two analyses differ they both expect about 60%–65% of the LSR to be late-successional habitat, which places the LSR at approximately 50% below the desired amount of habitat. Existing late-successional habitat in the south zone of the LSR is mainly in small patches and only a few drainages, such as Upper Cow Creek, contain larger blocks (Map 3).

Fire has diverged from its historic behavior patterns and severity levels. Although ignitions still occur, fires are quickly suppressed. As a result, the median fire return interval has increased to 21.5 years (Taylor and Skinner 1998). Fire suppression efforts have reduced the amount of area burned annually, resulting in a change in the species composition, forest structure, and expected fire

behavior. Without fire as a disturbance process there has been an increase in the amount of vegetation growing on site (stand density). Higher stand densities result in an increased competition for resources (e.g., nutrients, sunlight, and water). As weaker trees die they add to the surface fuels on the forest floor. More fuel on the forest floor increases fire intensity. Shade tolerant white fir (a species which is easily killed by fire) is more abundant and has become established in the understory. The shade tolerant understory creates a ladder for surface fire to move into tree crowns. These conditions result in a greater likelihood of fires that burn hot enough to kill large numbers of trees. Increased fire intensities can also make suppression efforts more dangerous and difficult.

The combined effect of the railroad logging and fire suppression has resulted in vegetation patterns that are different from the patterns that would have occurred historically. The late-successional characteristics (closed forest canopy, multi-layered stands with large trees, snags and logs) that were more commonly found at lower slope positions, and on north and east facing slopes, were removed when the railroad logging occurred. Due to the regeneration of these stands in the absence of fire, there is a greater abundance of closed canopy stands dominated by densely growing, smaller trees across the landscape. This is also true, and of particular concern, on the upper slopes, ridges, and south and west aspects where stands with open canopies and large trees (pines and Douglas-fir) historically occurred.

The prominent ridges within the Project Area are characterized by a variety of forest conditions. At higher elevations (above 5,000') the ridges are dominated by true fir stands. Many of these stands are dense and contain heavy ground and ladder fuels. Small patches (1–2 acres) of more open-canopy stands are scattered throughout. The lower- and mid-elevation ridges are occupied by mixed conifer stands with some structural variability. Many of the stands at this elevation range have a closed canopy (>60%) and heavy ground and ladder fuels, particularly in areas where white fir is a significant component of the stand. Ridge top stands with larger diameter trees, more open canopies, and lighter fuel loads exist, particularly on south and west aspects, but comprise a smaller percentage of the stands in this elevation range.

The LSR network is an integral component of the conservation strategy for the federally listed NSO on Federal lands. Although the NWFP scientists did not envision the LSRs being fully functional within the first decade of the plan, they expected that LSRs would be managed toward that goal. The majority of forested stands in the south zone of the Mt. Ashland LSR are in early- and mid-successional condition. These stands provide limited amounts of NSO habitat because they typically lack large diameter trees and snags, large trees with deformities or cavities, multi-storied canopies, and large logs on the ground. Extensive survey efforts in the Project Area over the past five years indicate a highly variable but overall low density and reproductive rate of NSO pairs (USDI Fish and Wildlife Service 2006).

1.4.3 Desired Condition

The paragraphs within this section describe general Desired Conditions on the landscape. These conditions will vary according to site aspect, elevation, and capability. Desired Conditions are further described for the three main categories of vegetation in the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) and the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999), and are discussed in subsequent sections of this FEIS.

The Desired Condition is to have 60%–65% of the capable land within the LSR as late-successional forest habitat (USDA Forest Service 1999, 2-98; USDA Forest Service 1996a, 13). Late-successional forest habitat is distributed in a mosaic pattern, interspersed with stands in different successional stages (openings, patches of early and mid-successional forest), and supports a variety of vegetative types including mixed conifer, true fir, and pine. The quantity and distribution of late-successional habitat within the LSR ensures connectivity across the LSR and supports viable populations of late-successional associated wildlife species. The entire LSR supports up to 20 pairs of NSOs over time. The spatial distribution of successional stages within the LSR shifts over time (ibid.).

North and east aspects contain mixed conifer stands, dominated by Douglas-fir at lower elevations and Douglas-fir and white fir at higher elevations. Pine species dominate the south and west aspects as well as ridges. These stands contain trees of varying heights, large live trees and snags, and coarse woody debris on the forest floor in amounts that meet LRMP Standards and Guidelines. Stands on south and west aspects are more open and have fewer snags and less woody material on the forest floor than stands on north and east aspects. The high elevation true fir stands are generally single-storied (trees of similar heights), contain large diameter snags, and have abundant large woody material on the forest floor.

The landscape is resilient to disturbances such as fire, insects and disease. Throughout the LSR, forested conditions and landscape patterns are more typical of historic mixed severity fire regime. Upper slopes and ridges are in a more open condition with low levels of surface and ladder fuels. In patches, fires burn with sufficient intensity to kill trees and create small one- to five-acre openings in the canopy. Burn openings occupy <10% of the stands (USDA Forest Service 1999, 3-1–3-2). Species composition favors fire resistant species, tree density is within sustainable levels, and there is a balance between the number of large and small trees. Disturbances that create patches (<200 acres) of early successional habitat are expected over the long-term, but the landscape is relatively resistant to large-scale fires (>200 acres).

The upper ridges are in a condition where fire suppression crews can work safely and effectively. Fires can be started intentionally to reduce surface and ladder fuels. Wildfires that do occur will not kill large numbers of trees over large areas.

1.5 Need

It is evident through the comparison of the current and Desired Conditions, as outlined in the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a), the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999), and the LRMP (refer to Appendix C, Management Opportunities Related to the Mt. Ashland LSR Project), that the Mt. Ashland LSR is deficient in late-successional forest, and that tree species composition and stand structure in the Project Area has been significantly altered from its historic condition. Additionally, due to the current condition of vegetation in the Project Area, fires would be expected to burn at intensities that would result in a high level of tree mortality. Therefore, there is a need to promote the development of late-successional habitat and reduce the threat of catastrophic fire in the Project Area to ensure that the role and objectives for the Mt. Ashland LSR as described in the *Mt. Ashland Late Successional Reserve Assessment* Forest Service 1996a), and the NWFP, are realized and sustained over time. The comparison of current and Desired Conditions and identification of treatment needs are summarized in Table 1-1.

Table 1-1 Treatment Needs

Current Condition	Desired Condition	Need	How Proposed Project Addresses Treatment Need
Past harvest and natural regeneration have resulted in overly dense early and mid-successional forest conditions in the Project Area. Over-dense stands lack habitat structure. Mid-successional stands are currently young and vigorous and will respond favorably to density reduction.	Late-successional forest habitat is distributed in a mosaic with a variety of forest types; the distribution of forest ensures connectivity across the LSR. The landscape is resilient to large-scale disturbances.	Reduce density in early and mid-seral stands to encourage more diverse structure and promote more resistance to large-scale disturbance	Thinning will reduce density of early and mid-successional stands in Grouse Creek and Long John Creek drainages while stands are vigorous enough to respond to treatment. Promote development of late-successional conditions in areas that were logged in the past by using variable density thinning from below and maintaining large, healthy trees. Maintain existing stands of late-successional forest.
The south zone of the LSR (south of the Siskiyou Crest), where the Project Area lies, is 30,683 acres and has 6,610 acres (22%) in a late-successional forest condition (64% below desired).	Within the LSR, 60%–65% of the area is in a late-successional forest condition. Late-successional forest is resilient and dynamic (younger patches occur across the landscape over time as a result of natural disturbances).	Increase amount of late-successional forests	Use silvicultural treatments to accelerate development of late-successional forest in an area with an abundance of mid-successional forest: Grouse and Long John drainages. Promote growth on approximately 4,000 acres (13% of the south zone of the LSR).
Past timber harvest and fire suppression have resulted in a change in tree species composition favoring shade-tolerant fir at mid-elevations. South and west aspects, upper portions of slopes, and ridges are overly-dense (too many trees) and are dominated by fir and mixed conifer. Large pines are lacking.	North and east aspects are dominated by mixed conifer with red and white fir at higher elevations. Stands are denser on lower slopes and in drainage bottoms. South and west aspects are more open and are dominated by pine and mixed conifer. Higher elevations are dominated by true fir.	Restore species compositions and densities closer to pre-European conditions	Use thinning to reduce density and promote growth. Mimic more natural conditions by favoring pine on south and west aspects, upper slopes, and ridges. Maintain more dense stands lower in drainages and on north and east aspects. Manage for more open stands on south and west aspects, upper slopes, and ridges.
Fire suppression and past harvest have resulted in high levels of ground and ladder fuels. Conditions are such that fires can burn more intensely, killing more trees and making suppression efforts more difficult and dangerous.	Surface fuels and ladder fuels are reduced to levels that allow fires to burn without killing large numbers of trees over large areas. Conditions allow for opportunities to use fire to maintain conditions more typical of the historic fire regime.	Reduce chances of severe fires	Reduce the amount of fuel on the forest floor. Reduce the numbers of small trees growing which create ladders for surface fires to become crown fires. Potential treatments include thinning the smaller trees, pruning lower limbs, grinding small trees and shrubs, hand piling and burning material, or lighting fires under controlled conditions underneath larger forested stands

1.6 Proposed Action

The Project Area is located on the south slope of the Siskiyou Crest below Siskiyou Peak and Mt. Ashland. It ranges in elevation from approximately 3,200' to 6,700' within the Beaver Creek 5th-field watershed. The proposed project is located primarily within two 7th-field subwatersheds (Beaver-Grouse and Long John) with minor activity within three other subwatersheds (Deer-Beaver, Upper Cow, and Headwaters of Cottonwood Creek) (refer to Map 4). The Project Area is approximately 18 miles northwest of Yreka, California. The legal description is: T48N, R8W, Sections 15–17, 20–22, and 28, Mount Diablo Meridian; T41S, R1W, Sections 1–3 and 10–15; T41S, R1E Sections 5–7 and 18; T40S, R1W, Sections 25, 26, and 34–36; and T40S, R1E, Sections 31–32, Willamette Meridian (refer to Map 1 in Appendix A for a vicinity map). The Project Area occupies 13,939 acres with inclusions of approximately 550 acres of private land and 200 acres of Bureau of Land Management (BLM) land; however, no actions are proposed on private or BLM land.

The Proposed Action is summarized below; it is described in more detail in Chapter 2, and is displayed in Appendix A - Maps. Acreage and mileage figures are estimates; they were refined during the planning process and during field verification and may change slightly during field layout. All proposed vegetation management and related activities would be scheduled for completion within ten years of signing the ROD (note: the term "will" is used in this document to facilitate understanding of the Proposed Action, it does not mean that a Decision has been made regarding implementation). The Proposed Action includes:

- Thinning, or stand density control, as the primary silvicultural practice to meet the two objectives of the Purpose and Need (habitat restoration and reduced threat of historically uncharacteristically severe wildfire); there will be three major variations of this silvicultural practice as follows:
    - Variable density thinning in mid-successional forest [stands in which the majority of overstory trees are >9" DBH] to promote development of late-successional forest characteristics—thinning prescriptions will vary according to aspect and position on slope.
    - Thinning to reduce density and ladder fuels while favoring shade-intolerant, fire resistant species (such as pine) along ridges and upper slopes as part of a DFPZ
    - Thinning small diameter material (stands in which the vast majority of the trees are <9" DBH) to reduce ladder and ground fuels and promote growth
- Treatment of fuels to reduce the threat of stand-replacing fire
    - Within thinned stands, removal of limbs and foliage, setting fires under controlled conditions (underburning) to reduce surface fuels, grinding smaller trees and shrubs, and hand-piling and

burning small trees and surface fuels will be used to treat the surface and ladder fuels. Fuel generated during restoration (thinning) activities will be treated along with existing natural fuels.

° Small trees that act as ladder fuels will be cut down, piled by hand and burned.

° Outside of thinned stands, underburning will occur.

- Management of existing roads used during project activities.

  ° All roads used for project activities will have some level of maintenance (e.g., grading and reshaping, drainage dip and drainage structure maintenance and replacement, spot surfacing, clearing of logs, and brushing road prisms) to make them suitable for use, including hazard tree removal.

  ° After use, some system roads will be closed year-round or decommissioned.

  ° Existing, unauthorized roads will be added to the maintenance system; and some existing unauthorized roads used for project activities will be hydrologically stabilized and closed after use.

- Construction of temporary spur roads to facilitate project activities; temporary spur roads will be decommissioned after use.

- Construction of landings for use during thinning operations.

1.7 Decision Framework

Given the purpose and need, the Forest Supervisor of the KNF will review the alternatives and their associated environmental consequences to determine whether to implement the Proposed Action as described or select a different alternative, including the No Action Alternative. A Preferred Action shall be identified in the FEIS, and a ROD will then be issued containing the rationale for the decision and a discussion of any applicable mitigation measures and monitoring.

1.8 Management Direction

National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning, including Regional Guides, Land and Resource Management Plans, and site-specific documents, such as this FEIS. The higher-level documents are incorporated by reference and can be obtained from USFS offices or on the internet.

The LRMP provides guidance for managing National Forest System lands within the Forest. Guidance from the NWFP is incorporated in the LRMP. The LRMP was amended by the ROD and

Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines on January 12, 2001 (USDA Forest Service and USDI Bureau of Land Management 2001).

The LRMP provides forest-wide and management area direction. Forest-wide direction, which applies to all management areas, is located on pp. 4-3 through 4-66 of the LRMP (USDA Forest Service 1995a). (Note: All page references in this document refer to the version of the LRMP that includes all amendments as of November 21, 2001). This version can be found on the internet at http://www.fs.fed.us/r5/klamath/projects/forestmanagement/forestplan/index.shtml.

Management Areas have distinct management goals, management requirements, and Desired Conditions. The proposed project lies within Special Habitat–LSR (Management Area 5) and Riparian Reserve (Management Area 10). Table 1-2 displays a summary of the primary management direction for each Management Area pertinent to this proposal, as well as the LRMP pages containing the complete direction for each area.

Table 1-2 Management Area Direction

Management Area (MA)	Goals, Desired Conditions, and Standards and Guidelines	Pages in the LRMP (USDA Forest Service 1995a)
Special Habitat – LSRs (MA5)	**Goal** – Protect and enhance conditions of late successional and "old-growth" forest ecosystems which serve as habitat for late-successional and "old-growth" species including the NSO. **Applicable Standards and Guidelines:** MA5 - 1, 12, 13, 25, 26, 28–29, 38.	4-84– 4-89
Riparian Reserve (MA10)	**Goal** – Be consistent with Aquatic Conservation Strategy goals. Maintain and restore riparian-dependent structures and functions, provide benefits to riparian-dependent and transition zone species, and provide habitat connectivity. **Applicable Standards and Guidelines: MA10** – 2, 21, 42, 44, 45, 50, 51, 54, 59, 60, 61, 64, 65, 68, 71.	4-106– 4-114

1.9 Public and Agency Collaboration and Involvement

The Forest collaborated with the Yreka Field Office of the USFWS to develop a Proposed Action that restores and protects habitat for late-successional associated species, with an emphasis on Threatened species. The mission of the USFWS is to work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Scoping is defined as "...an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action" (40 Code of Federal Regulations 1501.7). The scoping process is used to invite public participation, to help identify public issues, and to obtain public comment at various stages of the analysis process. Notice of the proposal first appeared in the July 2004 Schedule of Proposed Actions for the KNF. The Schedule of Proposed Actions is posted on the Forest web page (USDA Forest Service 2006a) and paper copies are mailed to those who request them.

Notice of a public meeting and field trip to be held on September 29, 2004, was published in the Calendar of Events of the Siskiyou Daily News and the Ashland Daily Tidings. The newspaper notices provided public notice of the meeting and field trip; persons interested in attending such a field trip were invited to contact the Forest or USFWS project leaders. Flyers announcing the meeting and field trip were sent to 28 people, groups, and agencies. The meeting was attended by five members of the public and personnel from the USFWS, USDI National Marine Fisheries Service (NMFS) and the Forest Service.

A scoping letter, dated October 3, 2005, was mailed to 33 people and groups who expressed interest in the proposal, who owned property adjacent to the Project Area, and to agencies with responsibilities for local resource management. The scoping letter requested input by November 7, 2005. A Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on October 7, 2005. This notice requested comments within 30 days of the publication of the Notice of Intent in the Federal Register. Twenty-four comment letters or e-mails were received in response to the initial scoping and NOI.

Another public meeting was held on October 28, 2005, followed by a field trip to the Project Area on October 29, 2005. Flyers for the public meeting and field trip were sent to a larger mailing list (164 individuals, groups, agencies and newspapers) in order to include potentially interested parties from the communities of Ashland and Medford in Oregon. The meeting on October 28th was attended by eight members of the public and personnel from the USFWS, NMFS, and the Forest Service. The field trip on October 29th was attended by four members of the public.

A public open house was held on November 16, 2006; notice of the open house was sent to 68 people, including everyone who had responded to scoping. The open house was announced on page 2 of the Siskiyou Daily News on November 6, 2006. The purpose of the open house was to share information on the progress of the project, to display minor changes to the proposed action that resulted from field reconnaissance, and to show how scoping information was used to develop alternatives. The open house was attended by six members of the public and personnel from the USFWS, NMFS, and the Forest Service.

Consultation was initiated with the Karuk Tribe of California, the Quartz Valley Reservation, the Yurok Tribe, and the Hoopa Tribe through public meeting notices and the scoping letter dated October 3, 2005.

Representatives of the USFWS and the NMFS were actively involved in the initial design of the Proposed Action and have visited the units in the field. The USFWS is a cooperator and will continue to be involved in the design, layout and implementation of this project. Consultation with these agencies will continue throughout the planning process.

The Oregon Department of Environmental Quality (DEQ) and the North Coast Regional Water Quality Control Board were consulted by phone on June 27 and 28, 2006, respectively. Both agencies were mailed updated project information on December 18, 2006. Both agencies will continue to be provided with updated information and will be involved in the planning process for this project.

A meeting with the Klamath Siskiyou Wildlands Center, the USFWS and the Forest occurred on January 10, 2007. The purpose of the meeting was to clarify and discuss issues/concerns raised during scoping.

The DEIS was released for public review and comment on June 15, 2007. Comments were to be received through July 30, 2007. Comments were received from 143 individuals, organizations, and interest groups. Written comments arrived in seven mailed letters, seven email letters (one of which was signed by eight environmental interest groups), and one form letter sent in by 122 individuals. Public comments are summarized in Appendix H.

During and after the DEIS comment period, a series of public field trips were conducted to discuss public concerns about the DEIS, or the alternatives, and to clarify issues that were raised during the comment period. Field trips were held after the release of the DEIS in 2007 on July 10, 18, and 31; August 1, 28 and 29; September 4, and October 9, 10, and 26. Individuals from the following organizations, agencies or companies attended field trips: Klamath Siskiyou Wildland Center, Klamath River Keepers, Timber Products Inc., Roseburg Lumber Co., American Forest Resource Council, Lomakatsi Restoration Project, U.S. Fish and Wildlife Service (USFWS), and USFS. Discussion and information gathered during public field trips was used to address concerns raised during the comment period and to develop the Preferred Alternative.

A letter of concurrence, dated June 22, 2007, was received from the National Oceanic and Atmospheric Administration–Fisheries Service. This letter completes informal consultation and fulfills consultation requirements under Section 7 of the Endangered Species Act (ESA) (19 U.S.C. 1536 (c)). The letter concurs with the determination that the project is not likely to adversely affect

Southern Oregon and Northern California Coasts coho salmon and their Critical Habitat, or Essential Fish Habitat for Pacific Coast Salmon species.

A letter of concurrence, dated October 10, 2007, was received from the USFWS. This letter completes informal consultation and fulfills consultation requirements under Section 7 of the ESA (19 U.S.C. 1536 (c)). The letter concurs with the determination that the project is not likely to adversely affect NSOs and NSO Critical Habitat and is outside the range of the marbled murrelet.

The Environmental Protection Agency (EPA) was consulted via telephone on December 4, 2007, to discuss the EPA review process, ratings, and to address any concerns that they had regarding the project. Region 10 was assigned the project due to the amount of the Project Area in Oregon and per agreement with EPA Region 9 (San Francisco).

On June 16, 2006, consultation was initiated by telephone with the Oregon and California State Historic Preservation Offices (SHPOs); consultation with both offices is ongoing. The Project is consistent with the Programmatic Agreement for the California SHPO. On March 6, 2008, the Forest received verbal concurrence via telephone from the Oregon SHPO on a determination that the Project complies with Section 104 of the Historic Preservation Act and will have "no adverse effect" on historic properties.

The Public Involvement File contains documentation of the efforts made to involve interested members of the public, appropriate agencies, and tribal members in the planning process and the results of those efforts. The file is incorporated by reference and available in the Mt. Ashland Habitat Restoration and Fuels Reduction Project file. The interdisciplinary team used comments from the public, groups and other agencies to develop a list of issues.

1.10 Issues

Issues are points of discussion, debate, or dispute about the environmental effects of a project. The USFS separated the issues for this proposal into two groups: significant and non-significant issues. Significant issues were identified because of their extent, the duration of the effects, or the intensity of the resource conflict. Below are the significant issues identified through scoping:

Cumulative Watershed Effects: Use of ground based yarding systems during thinning, fuels treatments and road activities, when combined with effects of past, present and foreseeable future actions, may result in increased sediment production and peak flow that could impact water quality, channel stability, and aquatic habitat. The key indicators used to analyze this issue are:

- Cumulative Watershed Effects model outputs; and
- Project effects to anadromous fish habitat, specifically water temperature, stream substrate character (fines and embeddedness), and peak flows.

Spur Road Construction Effects on Habitat: Spur road construction will increase road density and may result in habitat fragmentation, increased edge habitat and harassment to wildlife. The key indicators used to analyze this issue are:

- Change in miles per square mile of roads (road density); and
- Acres of habitat removed.

Temporary Spur Road Construction Effects on Soils: Temporary road construction may result in long-term impacts to soil health, such as soil displacement, soil erosion, mass wasting, reduced slope stability, compaction, and loss of productivity. The key indicator used to analyze this issue is:

- Acres of reduced soil productivity.

All other issues were found to be non-significant for this proposal. Reasons issues are categorized as non-significant may include: (1) they are outside the scope of the Proposed Action; (2) they are already decided by law, regulation, LRMP, or other higher level decision; (3) they are irrelevant to the decision to be made; or (4) they are conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality regulations for the NEPA explains this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-significant issues and reasons regarding their categorization as non-significant may be found in Appendix G. Many of these non-significant issues are addressed in Chapter 3, as they are procedures required by law and regulation.

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

Federal agencies are required to "(r)igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (40 CFR 1502.14). This chapter describes and compares the alternatives considered for the Mt. Ashland Habitat Restoration and Fuels Reduction Project. The first section describes the alternative development process. The next section provides detailed descriptions of the alternatives considered in detail, including specific design features. This is followed by discussions of why other alternatives considered were eliminated from detailed study. The last section presents the alternatives considered in detail in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

2.1 Alternative Development Process

The proposed Project Area was identified as a priority for fuels and fire threat reduction and habitat restoration in the *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) and the "Westside LSR Team Review of Five LSRs on the Westside of the Klamath National Forest" (Westside LSR Team 2004).

The Forest Supervisor convened an interdisciplinary team in 2004 to develop a proposal that would reduce the threat of stand-replacing wildfire and accelerate the development of early- and mid-seral stands into late-successional forest habitat. GIS vegetation layers, aerial photograph interpretation and field reconnaissance were conducted to develop a preliminary proposal.

The team narrowed the proposed treatment area from the entire south zone of the LSR to the Long John and Grouse creek watersheds because these watersheds are dominated by early- and mid-successional stands that are healthy and vigorous enough to respond to thinning while at the same time pose a moderate fire risk. Within these watersheds, the treatment area was further refined by: (1) focusing on areas that have an abundance of early and mid-successional forest; (2) emphasizing areas that had been railroad logged; (3) eliminating the Hungry Creek sub-watershed due to potential cumulative watershed effects; (4) eliminating high elevation true fir stands from treatment that were not expected to respond well to thinning treatments and that already had desired attributes such as

decadence; (5) eliminating stands from treatment that are already on the right trajectory for habitat development; and (6) by eliminating stands >150 years old.

The preliminary proposal consisted of thinning, fuels reduction, and development of DFPZs. Thinning of previously logged, mid-successional stands was identified as a priority to meet LSR objectives. In addition, fire suppression has resulted in high fuel loading and white fir encroachment. White fir is less fire-resistant than the ponderosa pine, sugar pine, and Douglas-fir it is replacing (Taylor and Skinner 2003). Fuels reduction, mainly removal of small diameter material, was also identified as a high priority. The DFPZs along ridges were identified as important in limiting the area affected by wildland fire, breaking up fuel continuity, and providing control lines. The *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) and the Westside LSR Team (2004) identified DFPZs as critical to protecting treated stands and adjacent late-successional forest habitat.

The preliminary proposal was refined based on input from a public field trip held in September of 2004. Subjects of concern identified by the attendees included: minimizing silviculture and fuels treatments that use ground-based equipment, maintaining shade for streams, favoring tree species that were more abundant historically such as pine, and using the right tool to complete work efficiently.

The proposal was further refined based on information from modeling including:

- Cumulative watershed effects modeling
- Universal Soil Loss Equation (USLE)
- Equivalent Roaded Acres (ERA)
- Mass Wasting (GEO)
- NSO abiotic variable modeling (USDI Fish and Wildlife Service 2005)
- Fire modeling
- Forest Vegetation Simulator–Fire Fuels Extension (FVS-FFE)
- FARSIGHT
- FlamMap.

Potential treatment stands identified in the proposal were visited by a variety of specialists to ensure treatments were consistent with LRMP Standards and Guidelines and that they would lead to achievement of the Desired Conditions. Many project design features were included to reduce potential effects. The proposal was modified (reduction in acres of ground based systems and reduction in miles of proposed temporary spur roads) in June/July of 2006 to minimize the potential for detrimental soil effects and to meet Standards and Guidelines related to soil.

The Proposed Action, Alternative 2, was developed to achieve the purpose described in Chapter 1. Alternatives to the Proposed Action were developed to address significant issues that were identified

through the scoping process and the public meetings that were held. Alternative 3 was developed to address the significant issues of spur road construction effects on habitat and cumulative watershed effects. Alternative 4 was developed to address the significant issue of cumulative watershed effects and Alternative 5 was developed to address the significant issues of spur road construction effects on habitat and cumulative watershed effects. The Preferred Alternative was developed based on comment received on the DEIS.

2.2 Alternatives Considered in Detail

The KNF and USFWS cooperatively developed five alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public. Alternative 3 and a number of other alternatives were considered during the planning process, but eliminated from detailed study for the reasons documented later in this chapter. Alternatives 1, 2, 4 and 5 will be considered in detail and are discussed in this section. All acres and road mileages are estimates. All alternatives are described as if they will occur, but they are all proposals.

The action alternatives were designed to meet the Purpose and Need for action by using silvicultural techniques to promote restoration of late-successional forest habitat and using fuels treatments to reduce fuels and minimize threat of uncharacteristic (stand-replacing) wildland fire. While the number of acres proposed for treatment varies between action alternatives, the suite of silvicultural and fuels treatment prescriptions is common to all action alternatives because there were no significant issues related to prescriptions identified during scoping. The suite of activities is described in detail starting on p. 2-15 (Design Features Common to All Action Alternatives). Action alternatives include Alternatives 2, 4, 5, and the Preferred Alternative; Alternative 3 was dismissed from detailed analysis (See Alternatives Considered but Eliminated from Detailed Study, p. 2-32).

2.2.1 Alternative 1 – No Action

As required by NEPA and the HFRA, this alternative is included and analyzed as an option to implementing any of the action alternatives and as a baseline against which the action alternatives can be compared. It is also included in order to analyze the potential impacts of not implementing the proposed habitat restoration and fuels treatments. With the No Action Alternative, no silvicultural treatments and no fuels reduction activities would be implemented to accomplish project objectives. Stand conditions and fuel levels existing in the Project Area will not be altered and processes affecting conditions will continue. The appropriate response for a wildland fire would continue to be suppression.

2.2.2 Alternative 2 – Proposed Action

Alternative 2 was designed to meet the purpose and need for action. It will treat 4,706 acres in 258 stands as described in the following text. Activity and natural fuels will be treated in all stands. Road actions consist of maintenance, year-round closures, decommissioning, designating existing unauthorized roads as National Forest System roads, and the construction of 6.86 miles of temporary spur roads. Some landings will be constructed but existing landings will be used wherever possible. For treatment specific locations, refer to Maps 5, 6, and 9 in Appendix A.

2.2.2.1 Restoration Silvicultural Treatments

- Variable density thinning of trees >9" DBH on 2,589 acres in 158 stands
- Small diameter thinning of trees ≤9" DBH and below on 408 acres in 16 stands

2.2.2.2 Defensible Fuel Profile Zone

- Variable density thinning of trees >9" DBH on 1,286 acres in 49 stands as part of a defensible fuels profile zone along upper slopes and ridges

2.2.2.3 Associated Activities

- Small diameter thinning (<9" DBH) of understory trees in a subset of the 3,875 acres and 207 stands identified for variable density thinning above (small diameter thinning will occur as needed on a stand by stand basis)

2.2.2.4 Restoration Support Actions

- Helicopter systems to remove trees on 1,071 acres in 65 stands
- Skyline systems to remove trees on 1,602 acres in 75 stands
- Ground-based equipment systems to remove trees on 1,202 acres in 67 stands
- An estimated 35 existing landings will be used and may be enlarged to accommodate processing of small trees for bio-mass utilization; landing size will generally not exceed 0.5 acres for ground-based landings or 1 acre for helicopter landings, actual landing size will be determined by the need to maintain safe operations.
- An estimated 15 new ground-based system landings, 14 skyline system landings and 11 helicopter landings will be constructed. No new landings will be constructed within Riparian Reserves. Ground-

based and skyline landings will be up to approximately 0.5 acres in size, helicopter landings will be approximately 1 acre in size, actual landing size will be determined by the need to maintain safe operations. The total acreage disturbed by landing construction is not expected to exceed 25 acres.

- Landings will be hydrologically restored post-project. If it is pre-determined by an earth scientist that special erosion control measures are needed at a specific landing, they will be included in the contract as an erosion control measure.

2.2.2.5 Fuels Reduction Treatments

- Whole tree removal on slopes <35% on 1,202 acres in 67 stands
- Mastication of activity and natural fuels on 809 acres in 51 stands; mastication combined with handpile/burn on 436 acres in 15 stands
- Hand-pile and burn to reduce activity and natural fuels on 327 acres in 76 stands; handpile and burn followed by underburning on 979 acres in 42 stands
- Underburning to reduce activity and natural fuels on 1,382 acres in 72 stands. Additional underburning will occur outside of stand boundaries to riparian features
- Underburning to reduce natural fuel build-up in two stands on 120 acres
- Thinning out small trees and burning piled material to reduce ladder and surface fuels within Riparian Reserves on 303 acres in 31 stands

2.2.2.6 Restoration Support Road Actions

Several different types of road management activities will be implemented as part of the proposed action. The road management activity by specific road segments are described in Table 2-1.

Table 2-1 Alternative 2 Restoration Support Road Actions

Management Activity	Road Segment	Miles
On roads used for project activities, change from open to year-round closure.	40S09	3.05
	40S10 segment	0.82
	40S13A	1.72
	40S15A	2.20
	40S16A	1.01
	41S13	0.50
Decommission system roads used for project activities	40S20	.49
On roads used for project activities, put existing unauthorized roads on the System	40S06.2	1.98
	40S16.1 segment	0.23
	40S16.6	0.12
	41S15.1 segment	0.10
Existing unauthorized roads used for the project: open, use, hydrologically stabilize and close	40S09.1A	0.77
	40S09.1A1	0.11
	40S09.2	0.18

Management Activity	Road Segment	Miles
	40S12.1	0.15
	40S13.1	0.42
	40S13.2	0.08
	40S14.1	0.12
	40S14.2	1.14
	40S16.1 segment	0.10
	40S16.5 segment	0.04
	40S16.5B	0.17
	40S20.1	0.47
	40S20.1A	0.76
	41S07.3	0.80
	41S09A.1	0.21
	41S10.2	0.07
	41S10.3	0.14
	41S15.1 segment	0.19
	41S15.3	0.73
	41S15.3A	0.53
	48N30A.1	0.18
	48N37.1	0.64
New temporary spur road construction: construct, use, and decommission.	T206A	0.27
	T206B	0.07
	T207	0.43
	T216	0.14
	T228A	0.19
	T228B	0.19
	T232	0.06
	T235	0.29
	T254	0.73
	T264	0.11
	T266	0.14
	T277A	0.16
	T300	0.12
	T317	0.82
	T317	0.31
	T320A	0.39
	T320B	0.43
	T320C	0.36
	T374	0.14
	T380	0.45
	T383	0.2
	T401	0.86

2.2.3 Alternative 4

Alternative 4 was designed to respond to the significant issue of cumulative watershed effects by reducing acres treated, reducing acres treated using ground-based systems, and by constructing fewer temporary spur roads. Many features of Alternative 4, including the types of treatments and road actions, are similar to Alternative 2; differences between the alternatives are displayed below.

Alternative 4 will treat 4,185 acres in 217 stands (refer to Appendix A). Activity and natural fuels will be treated in all stands. Silvicultural and fuels prescriptions are the same as those described in Section 2.2.2. Road actions are the same as those displayed for Alternative 2 except that 4.96 miles of temporary spur road will be constructed (1.9 fewer miles) and six fewer landings will be constructed (2.5 fewer acres) than under Alternative 2.

2.2.3.1 Habitat Restoration/Promotion Silvicultural Treatments

- Variable density thinning of trees >9" DBH on 2,079 acres in 119 stands
- Small diameter thinning of trees ≤9" DBH on 408 acres in 16 stands

2.2.3.2 Defensible Fuel Profile Zone

- Variable density thinning of trees >9" DBH on 1,275 acres in 49 stands as part of a defensible fuels profile zone along upper slopes and ridges

2.2.3.3 Associated Activities

- Small diameter thinning of understory trees in a subset of the 3,354 acres and 168 stands identified for variable density thinning above (thinning will occur as needed on a stand by stand basis)

2.2.3.4 Restoration Support Actions

- Helicopter systems to remove trees on 861 acres in 51 stands
- Skyline systems to remove tress on 1,528 acres in 70 stands
- Ground-based equipment systems (including mechanical harvester, tractor, tractor-endline, and a combination of all three) to remove trees on 965 acres in 47 stands
- An estimated 35 existing landings will be used and may be enlarged to accommodate processing of small trees for bio-mass utilization; landing size will not exceed 0.5 acres for each ground-based landing or 1 acre for each helicopter landing.
- An estimated 12 new ground-based system landings, 11 skyline system landings and 11 helicopter landings will be constructed. No new landings will be constructed within Riparian Reserves. Ground-based and skyline landings will be up to 0.5 acres in size, helicopter landings will be up to 1 acre in size. The total acreage disturbed by landing construction will not exceed 22.5 acres.
- Landings will be hydrologically restored post-project. If it is determined by an earth scientist that special erosion control measures are needed, they will be implemented on a site by site basis.

2.2.3.5 Fuels Reduction Treatments

- Whole tree removal on slopes <35% on 989 acres in 48 stands
- Mastication to reduce activity and natural fuels on 535 acres in 35 stands; mastication combined with handpile/burn on 353 acres in 11 stands
- Hand-pile and burn to reduce activity and natural fuels on 209 acres in 63 stands; handpile and burn followed by underburning on 939 acres in 42 stands
- Underburning to reduce activity and natural fuels on 1,318 acres in 67 stands. Additional underburning will occur outside of stand boundaries to riparian features
- Underburning to reduce natural fuel build-up in two stands on 120 acres
- Thinning out small trees and burning piled material to reduce ladder and surface fuels within Riparian Reserves on 303 acres in 31 stands

2.2.3.6 Restoration Support Road Actions

- Roads changed from open to year-round closure, roads decommissioned, and roads put on the system are the same as displayed for Alternative 2

Table 2-2 Alternative 4 Restoration Support Road Actions

Management Activity	Road Segment	Miles
Existing Unauthorized roads used for the project: opened, used, hydrologically stabilized and closed.	40S09.1A	0.77
	40S09.1A1	0.11
	40S09.2	0.18
	40S12.1	0.15
	40S13.1	0.42
	40S13.2	0.08
	40S14.1	0.12
	40S14.2	1.14
	40S16.1 segment	0.10
	40S16.5 segment	0.04
	41S09A.1	0.21
	41S10.2	0.07
	41S10.3	0.14
	41S15.1 segment	0.19
	48N30A.1	0.18
	48N37.1	0.64
New Temporary Spur Road Construction: construct, use, decommission.	T206A	0.27
	T206B	0.07
	T206C	0.19
	T216	0.14
	T228A	0.19
	T228B	0.19
	T235	0.29
	T264	0.11
	T277A	0.16

Management Activity	Road Segment	Miles
	T300	0.12
	T317	0.82
	T317	0.31
	T320B	0.43
	T320C	0.36
	T380	0.45
	T401	0.86

2.2.4 Alternative 5

Alternative 5 was designed to respond to the significant issues of temporary spur road construction effects on habitat and cumulative watershed effects by reducing total acres treated, reducing acres treated using ground-based and skyline systems, reducing acres of mastication, and by constructing fewer temporary spur roads. Many features of Alternative 5, including the types of treatments and road actions, are similar to Alternative 2 although some stand boundaries vary between Alternatives 2 and 5 (stands have been split to accommodate different tree removal systems). Differences between the alternatives are displayed below.

Alternative 5 will treat 4,612 acres in 258 stands. Activity and natural fuels will be treated in all stands. Silvicultural and fuels prescriptions are the same as those described for Alternatives 2 and 4 (see prescriptions below) but the acres treated are different. Road actions are the same as those displayed for Alternative 2 except that three fewer existing roads will be used and 2.27 miles of temporary spur roads will be constructed (4.59 fewer miles). Nine fewer landings will be constructed (4 fewer acres) than under Alternative 2. Refer to Appendix A for location specific treatment information.

2.2.4.1 Restoration Silvicultural Treatments

- Variable density thinning of trees >9” DBH on 2,579 acres in 159 stands
- Small diameter thinning of trees ≤9” DBH and below on 408 acres in 16 stands

2.2.4.2 Defensible Fuel Profile Zone

- Variable density thinning of trees larger than 9” DBH on 1,202 acres in 50 stands as part of a DFPZ along upper slopes and ridges

2.2.4.3 Associated Activities

- Small diameter thinning of understory trees in a subset of the 3,781 acres and 209 stands identified for variable density thinning above (thinning will occur as needed on a stand by stand basis)

2.2.4.4 Restoration Support Actions

- Helicopter systems to remove trees on 1,245 acres in 74 stands
- Skyline systems to remove tress on 1,471 acres in 73 stands
- Ground-based equipment systems to remove trees on 1,065 acres in 62 stands
- An estimated 35 existing landings will be used and may be enlarged to accommodate processing of small trees for bio-mass utilization; landing size will not exceed 0.5 acres for each ground-based landing or 1 acre for each helicopter landing.
- An estimated 13 new ground-based system landings, seven skyline system landings and 11 helicopter landings will be constructed. No new landings will be constructed within Riparian Reserves. Ground-based and skyline landings will be up to 0.5 acres in size, helicopter landings will be up to 1 acre in size. The total acreage disturbed by landing construction will not exceed 21 acres.
- Landings will be hydrologically restored post-project. If it is determined by an earth scientist that special erosion control measures are needed, they will be implemented on a site by site basis.

2.2.4.5 Fuels Reduction Treatments

- Whole tree removal on slopes <35% on 1,065 acres in 62 stands
- Mastication to reduce activity and natural fuels on 687 acres in 48 stands; mastication combined with handpile/burn on 375 acres in 14 stands
- Hand-pile and burn to reduce activity and natural fuels on 344 acres in 76 stands; handpile and burn followed by underburning on 967 acres in 42 stands
- Underburning to reduce activity and natural fuels on 1,408 acres in 78 stands; additional underburning will occur outside of stand boundaries to riparian features.
- Underburning to reduce natural fuel build-up in two stands on 120 acres
- Thinning out small trees and burning piled material to reduce ladder and surface fuels within Riparian Reserves on 303 acres in 31 stands

2.2.4.6 Restoration Support Road Actions

- Roads changed from open to year-round closure, roads decommissioned, and roads put on the system are the same as displayed for Alternatives 2 and 4.

Table 2-3 Alternative 5 Restoration Support Road Actions

Management Activity	Road Segment	Miles
Existing Unauthorized roads used for the project: opened, used, hydrologically stabilized and closed	40S12.1	0.15
	40S13.1	0.42
	40S13.2	0.08
	40S14.1	0.12
	40S14.2	1.14
	40S16.1 segment	0.10
	40S16.5 segment	0.04
	40S16.5B	0.17
	40S20.1	0.47
	40S20.1A	0.76
	41S07.3	0.80
	41S09A.1	0.21
	41S10.2	0.07
	41S10.3	0.14
	41S15.1 segment	0.19
	41S15.3	0.73
	41S15.3A	0.53
	48N30A.1	0.18
	48N37.1	0.64
New Temporary Spur Road Construction: construct, use, decommission	T216	0.43
	T228B	0.19
	T232	0.19
	T235	0.06
	T277A	0.14
	T300	0.16
	T320B	0.31
	T374	0.43
	T380	0.36

2.2.5 Preferred Alternative

The Preferred Alternative was developed after issuance of the Draft EIS to respond to comments and input from the public. Public input was provided during the 45-day comment period and during 10 public field trips that occurred during the 2007 field season. Modifications were made to the existing proposal to further respond to concerns over spur road construction, concerns about effects along the Pacific Crest Trail, concerns about the economics of the project, and to respond to a general support of underburning as a fuels treatment.

The Preferred Alternative has the following changes from Alternative 2:

- Stands 250, 312, 313, and 314 along the Pacific Crest Trail have been dropped.
- Stand 703 has been dropped to avoid road re-construction on roads 40S20.1 and 1A.

- Stands 235 and 339 have been dropped due to the dropping of spur road T235.
- Stand 440 has been dropped due to infeasibility of underburning that stand.
- There are 13 fewer spur roads than Alternative 2; remaining spurs are only located on ridge tops or upper slopes in this alternative.
- Spur road mileage has been reduced from 6.72 to 1.70 miles; spur roads T206A, T206B, T228A, T228B, T235, T254, T264, T277A, T317A, T320A, T320B, T320C, T380, T383, and T401 have been dropped and ridgetop road 40S02.1 has been extended approximately 1/10th of a mile.
- There is reduced helicopter yarding (from 1,071 to 935 acres).
- There is reduced ground based equipment yarding (tractor, tractor end-line, mechanical harvester) (from 1,202 to 1,056 acres).
- There is increased cable yarding (from 1,602 to 1,610).
- There are more new landings proposed to facilitate yarding but less acreage affected due to smaller skyline landings on system roads (43 new landings, 22 acres).
- There are fewer acres treated with timber harvest (from 3,875 to 3,601).
- There is more underburning to reduce fine fuels and ladder fuels outside of thinning stands (from 120 to 1,453 acres); the additional underburning consists of six "batched" underburn areas as displayed on Map 14.
- There will be 208 less acres of mastication and mastication will occur only on slopes ≤ 35%.
- In true fir stands, as part of the prescription, red fir will be favored in stands that are dominated by white fir to increase diversity.

Many features of the Preferred Alternative are similar to the other action alternatives; such as thinning prescriptions. The specific components of the Preferred Alternative, that are different from the other action alternatives, are displayed below in the description. For treatment stands, spur location, and landing locations and fuel treatments, refer to Maps 13 and 14 in Appendix A.

The Preferred Alternative will treat 4,468 acres in 247 stands and 1,297 acres in six underburn areas. Activity and natural fuels will be treated in all stands. Silvicultural and fuels prescriptions are the same as those described for Alternative 2 (see prescriptions below) but the acres treated are different. Road actions are the same as those displayed for Alternative 2 except that three fewer existing roads will be used and 1.7 miles of temporary spur roads will be constructed (5.01 fewer miles than Alternative 2). It is estimated that the number of landings constructed will increase but less acreage will be affected (43 landings and 22 acres potentially disturbed) than under the other action alternatives.

2.2.5.1 Restoration Silvicultural Treatments

- Variable density thinning of trees >9" DBH on 2,543 acres in 154 stands
- Small diameter thinning of trees ≤9" DBH and below on 408 acres in 16 stands; hand-piling (253 acres), underburning (97 acres) and mastication (58 acres) will be used to treat resultant fuels.

2.2.5.2 Defensible Fuel Profile Zone

- Variable density thinning of trees larger than 9" DBH on 1,058 acres in 42 stands as part of DFPZs along upper slopes and ridges

2.2.5.3 Associated Activities

- Small diameter thinning of understory trees in a subset of the 3,601 acres and 196 stands identified for variable density thinning above (thinning will occur as needed on a stand by stand basis).

2.2.5.4 Restoration Support Actions

- Helicopter yarding systems to remove trees on 935 acres in 53 stands
- Skyline systems to remove tress on 1,610 acres in 79 stands
- Ground-based equipment systems to remove trees on 1,056 acres in 64 stands
- An estimated 35 existing landings will be used and small material or brush may be cleared to accommodate yarder swing or processing of small trees for bio-mass utilization.
- An estimated 43 new landings will be constructed. No new landings will be constructed within Riparian Reserves. Ground-based and skyline landings will be between 0.25 and 0.5 acres in size, helicopter landings will be up to 1 acre in size. The total acreage disturbed by landing construction will not exceed 22 acres.
- In addition to constructed landings and existing landings, logs will be landed on the existing road bed during cable yarding ("continuous landing" along roads) on roads 41S09, 41S10, 40S06.2, 40S06, 48N28, 41S15, and 40S14. Minor clearing of small material and brush may occur where needed and roads may be closed to public access during operation.
- Landings will be hydrologically restored post-project. If it is determined by an earth scientist that special erosion control measures are needed, they will be implemented on a site by site basis.

2.2.5.5 Fuels Reduction Treatments

- Whole tree or tops-attached tree removal in stands treated by ground-based yarding systems on slopes <35% on 1,056 acres in 64 stands

- Yarding tops-attached in skyline and helicopter stands to minimize activity fuels.
- Mastication to reduce activity and natural fuels on 995 acres in 58 stands; mastication combined with hand-piling on 42 acres in 3 stands.
- Hand-pile and burn to reduce activity and natural fuels on 566 acres in 34 stands; hand-pile and burn followed by underburning on 140 acres in 2 stands.
- Underburning within thinning stands to reduce activity and natural fuels on 1,916 acres in 95 stands.
- Underburning as a stand-alone treatment to reduce natural fuel build-up in three stands on 156 acres
- Underburning outside of thinning stands to reduce fine ground fuels and ladder fuels in "batched" burn areas on 1,297 acres.
- Thinning small trees and burning material to reduce ladder and surface fuels within Riparian Reserves on 303 acres in 31 stands.

2.2.5.6 Restoration Support Road Actions

Roads changed from open to year-round closure, roads decommissioned, and roads put on the system are the same as displayed for Alternatives 2, 4 and 5.

Table 2-4 Preferred Alternative Restoration Support Road Actions

Management Activity	Road Segment	Miles
Existing Unauthorized roads used for the project: opened, used, hydrologically stabilized and closed	40S09.1A	0.77
	40S09.1A1	0.11
	40S09.2	0.18
	40S12.1	0.15
	40S13.1	0.42
	40S13.2	0.08
	40S14.1	0.12
	40S14.2	1.14
	40S16.1 segment	0.10
	40S16.5 segment	0.04
	40S16.5B	0.17
	40S20.1	0.47
	40S20.1A	0.76
	41S07.3	0.80
	41S09A.1	0.21
	41S10.2	0.07
	41S10.3	0.14
	41S15.1 segment	0.19
	41S15.3	0.73
	41S15.3A	0.53
	48N30A.1	0.18
	48N37.1	0.64
	41S13 to Stand 381	~0.38
	40S06.2 to Stand 253	~0.25

Management Activity	Road Segment	Miles
New Temporary Spur Road Construction: construct, use, decommission	T207	0.43
	T216	0.14
	T232	0.06
	T266	0.14
	T300	0.12
	T317	0.47
	T380A	0.16
	T206C	0.19

2.3 Design Features Common to All Action Alternatives

The following design features are common to Alternatives 2, 4, 5, and the Preferred Alternative. Any differences between alternatives are described in the text.

- Maintenance of haul roads would be performed on system roads used for hauling. Maintenance includes clearing vegetation for site distance or vehicle passage; removing slide and slough material; grading for a smooth road surface; constructing, maintaining or removing ditches, water bars, or rolling dips; outsloping the roadway; installation of culverts; rocking the road surface with aggregate surfacing; and/or armoring fill slopes with rip rap. Some maintenance work is universally required for hauling such as grading, dust abatement, and possibly clearing. Other maintenance work is typically not needed for hauling; but it improves watershed conditions, and/or protects the road facility itself by reshaping, and/or armoring surfaces with outsloping, rolling dips, spot rocking, and/or placing rip rap on fill slopes.

- Expected haul of forest products is from extent of treatment on local roads; then down (southerly) 40S16 and out the Klamath River Hwy to Yreka, California, with limited volumes down 41S07 and onto Road 11 (Beaver Creek Road) and east to I-5 at Hilt, California. It is unlikely, but some volume may come out of the area by going north over the Siskiyou Crest on the Rogue River National Forest's Road 22 and into Ruch, Oregon; or possibly from the 4 Corners area east on 40S06 to 40S11 and up to the Siskiyou Crest and the paved Ski Bowl Road, then eastward down the crest to I-5.

- Dust Abatement–Development and use of Water Sources. Existing water sources will be used for dust abatement; access roads will be improved (e.g., rocked, sloped away from creek, shaped, containment area created, brush removed) prior to use. All improvement work will be approved and inspected by the Forest. Dust abatement measures (BMP 2.23) will minimize fine sediment generated and transported from work sites. Drafting will follow the National Oceanic and Atmospheric Administration Fisheries Water Drafting Specifications (USDC NMFS 2001) and relevant best management practices (BMPs), including erosion control and proper drainage (BMPs 2.2 and 2.21). Key provisions for anadromous fish bearing streams include the use of a fish screen placed parallel to the flow with specified openings, pumping rates <350 gallons per minute and <10% of the flow, and stopping the pump when the tank is full. Five water sources have been identified for dust abatement (see Map 5):

  ° Beaver Creek at junction of roads 40S16 and 48N10, S1/2 Section 28
  ° Long John Creek 40S16 at junction with Creek, NE1/4 Section 21
  ° Grouse Creek at 40S06, SW1/4 Section 32
  ° Grouse Creek at 40S15, NE1/4 Section 31
  ° Secondary water source on 40S16A at junction with Long John Ck, Section 36

- Rock Sources–Aggregate surfacing may be used for spot rocking. There is an existing rock pit (for pit run) at mile post 1.00 on Forest Road 48N14. Commercial sources for crushed aggregate are available.

- Rock Sources–Rip rap would be available in small amounts in the Project Area.

- Road Access – Roads to identified hunting camps will be open during deer season.

- Road closure devices would be used to close roads proposed for year round closure.

- Traffic Safety and Control Plans will be completed prior to commencing project operations. The Plan will provide for public safety on USFS controlled roads and trails open to public travel.

- Roads and trails open to the public will be kept open or only closed for short durations. Project activities will minimize conflicts with public use on weekends and holidays.

- Dispersed campsites will be maintained in a usable condition if possible, however they are not protected nor managed as developed sites.

- Warning signs will be posted on the Pacific Crest Trail during any adjacent project activities.

- Ultramafic Rock–Neither work nor haul is proposed in mapped ultramafic rock units in California, so there is no reporting requirement. Less than ¼ mile each on haul roads 40S14, 40S16, 41S10, 41S15 are within mapped ultramafic rock units in Oregon, where there are no reporting requirements. There are no special requirements other than advising prospective bidders that the project includes ultramafic rock areas that may contain asbestos.

- Road Restoration Actions–Hydrologic stabilization, closure, or decommissioning will be conducted to minimize watershed effects. Hydrologic stabilization and decommissioning consists of the following types of activities: blocking entrance to the road, revegetation of surface, water barring, removing fill and/or culverts, establishing drainways, removing unstable road shoulders, recontouring and/or restoring natural slopes. The surface of decommissioned roads will be prepared for seed and plant establishment as necessary. Snow plowing of roads may be necessary under some circumstances. Snow plowing will follow Wet Weather Operation Standards (USDA Forest Service 2002a) and BMP 2.25 to prevent adverse effects to roads which could cause erosion to stream channels.

- Project design features for maintaining and improving physical conditions and ecological processes within unstable lands (Riparian Reserves) are incorporated into treatment prescriptions and are described in the Geology Report, (de la Fuente 2007). These Riparian Reserve prescriptions are modifications of standard project thinning and fuels reduction prescriptions that are tailored to each type of Riparian Reserve. The goal is to promote healthy riparian ecosystems, good fish and wildlife habitat, and stable slopes. The project geologist will be consulted or involved during planning and layout of these design features.

2.3.1 Description of Activities and Prescriptions

All three of the action alternatives utilize the following treatment prescriptions to meet objectives as defined in the Purpose and Need. Specific treatment acres and associated activities are listed by alternative in the previous sections.

2.3.1.1 Silvicultural Prescriptions

Several silvicultural prescriptions would be used in the action alternatives. Levels of each of the following prescriptions are summarized in Table 2-6 Comparison of Alternative (p. 2-36).

Variable Density Thinning of Trees >9" DBH

The silvicultural prescriptions are designed to promote the development of late-successional forest habitat while retaining any late-successional attributes (large decadent or deformed trees, large individual snags or snag patches, etc.) the stands may currently exhibit. Stands in the Project Area are generally 80–90 years old and fairly vigorous with good potential for development. All stands would receive variable density thinning from below with modifications for the stand's topographic aspect, slope position, species composition, and relationship to other key habitat features (Table 2-5 General Thinning Prescriptions for Trees >9" DBH). Trees in the smaller size classes (generally 3" to 20" diameter) would be removed; the removal of white fir would be emphasized.

The objective of variable density thinning is to promote diversity across the landscape while concentrating growth on the residual trees, which are the larger and more vigorous trees in the stand that have the ability to respond when competition is reduced. These trees have bigger crowns and a greater capacity to photosynthesize and increase their size as more light reaches the full canopy. These trees also have the best root systems and the greatest potential to extend their roots to take advantage of the increase in site resources made available after thinning. A strategy for maintaining larger-diameter conifers in stands where they currently exist focuses on commercial (>9") and pre-commercial (≤9") thinning of understory vegetation (Main and Amaranthus 1996). Thinning from below, while retaining the larger, healthier trees, will maintain overall stand growth (Oliver 1988).

Prescriptions would be applied to stands that have interlocked tree crowns and whose radial growth is declining. Typically trees in the lower crown classes (intermediate and suppressed) and those of poorest vigor and form are removed. Drought tolerant tree species, such as pine, would be favored over less tolerant species such as white fir. As part of the prescription, trees >20" DBH will be retained within habitat restoration/promotion stands. However, during implementation, trees > 20" DBH may be removed as a safety precaution (e.g., hazard trees, tailhold or guy line trees).

Variable density thinning will result in variable basal area (BA) and stand density index (SDI) measures within treated stands depending on condition and expected function of the post-treatment stands. Tree BA is the cross-sectional area at breast height (4.5' above the ground) measured in square feet (ft^2). BA is used to estimate tree volumes and stand competition. SDI is a relative measure of stocking levels expressed as a number of 10" DBH trees per acre. Estimates of stand density are made to express the degree to which the growing space available for tree growth is utilized. Table 2-5 displays the post-treatment desired average BA and SDI measures by treatment category and aspect/slope position. This information will be used to compare alternatives.

Table 2-5 General Thinning Prescriptions for Trees >9" DBH

Aspect/ Slope Position	Retention Species* Emphasis In Order	Crown Closure Retained	Average SDI In Trees Per Acre	Average BA (ft^2/Acre)	Thinning Density Variation	Large Tree Treatment
Habitat Restoration/Promotion Silvicultural Prescriptions						
North and east aspects, lower half of slope	DF, SP PP/JP, IC, WF; all hardwoods	60%	200	140	15% unthinned, 15% thinned heavily, 70% intermediate	Retain trees >20" dbh
North and east aspects, upper half of slope	DF, SP PP/JP, IC, WF; all hardwoods	40%–60%; grading from 60% midslope to 40% upslope	180	120	15% unthinned, 15% thinned heavily, 70% intermediate	Retain trees >20" DBH; thin to drip line plus 20' around large (≥24") SP and PP; drip line plus 10' around large DF
South and west aspects lower half of slope	DF, SP PP/JP, IC, WF; all hardwoods	50%–60%	180	130	15% unthinned, 15% thinned heavily, 70% thinned to 50%–60% crown closure.	Retain trees >20" DBH
South and west aspects, upper half of slope	SP PP/JP, IC, DF, WF; all hardwoods	40%–50%; some stands as low as 30%	160	110	15% unthinned, 15% thinned heavily, 70% intermediate w/ 40%–50% crown closure	Retain trees >20" DBH; thin to drip line plus 20" around large (≥24") SP and PP; drip line + 10" around large DF
Upper elevation, true fir, all aspects and slopes	RF, WF – others SP, DF, PP/JP, IC	60%	260	180	Small diameter, dense stands (≤12"), 10%–15% of stand thinned to create openings 0.25–0.50 acre.	Retain trees >20" dbh

Aspect/ Slope Position	Retention Species* Emphasis In Order	Crown Closure Retained	Average SDI In Trees Per Acre	Average BA (ft^2/Acre)	Thinning Density Variation	Large Tree Treatment
DFPZ Silvicultural Prescription						
Well defined ridges	SP PP/JP, DF, IC, WF	30%–50%; feathering to 40%–60% moving down slope	180	110	15% of each stand left unthinned	Trees >20" are rarely removed; may be removed for culturing of larger trees. thin to drip line plus 20" around large (≥24") SP and PP; drip line + 10" around large DF
Lower ½ of slope where ridge not well defined	DF, SP PP/JP, IC, WF; all hardwoods	50%–60%	200	140	15% unthinned, 15% thinned heavily, 70% thinned to 50%–60% crown closure	Trees >20" are rarely removed; may be removed for culturing of larger trees. thin to drip line plus 20" around large (≥24") SP and PP; drip line + 10" around large DF

* DF=Douglas-fir, SP=sugar pine, WF=white fir, PP=ponderosa pine, JP=Jeffrey pine, IC=incense cedar, RF=red fir.

Small Diameter Thinning of Trees <9" DBH (Plantations)

These treatments would be applied to the 1"–9" DBH trees found in early-successional stands with natural regeneration (outside of the variable density thinning stands described above). Some stands currently have a young component of overstocked trees that are growing and developing slowly due to inter-tree competition (approximately 408 acres). Thinning these areas would increase growth to provide for larger trees in a shorter period of time (DeBell et al. 1997). Spacing will be somewhat variable depending on species, aspect, site quality, and slope position. Thinning is done by crews using chainsaws but could be accomplished mechanically in those stands planned for tractor or mechanized harvesting operations. Cut material would be lopped and scattered to decompose, or hand piled and burned.

Thinning of Understory Trees within Habitat Promotion Stands

This treatment would be applied to small diameter trees (1"–9" DBH) found in the lower layer of variable-density thinning (habitat promotion) stands mentioned above. This is similar to small

diameter thinning above, but pertains to scattered individuals and clumps of understory trees that are unhealthy and lacking vigor. It involves the removal of small trees of poor vigor and form, or diseased trees that will not develop into larger healthy trees in the future. Also small trees of less desired species would be removed. It is not a technique to eliminate disease within a stand but will lessen its impacts by reducing density related competition and spread. This treatment removes small trees from an already disease infected stand, reducing the number of trees getting infected and concentrating growth on the remaining trees in the stand. Removal of small diameter trees in the understory will reduce ladder fuels and limit potential for spread of fire into tree crowns. This work would usually be done by crews using chainsaws but could be accomplished mechanically in those stands planned for tractor or mechanized harvesting operations. Cut material would be lopped and scattered, hand piled and burned or removed to a designated disposal area.

2.3.1.2 Defensible Fuel Profile Zones

In DFPZs, surface fuels are reduced to levels that generate low fireline intensity; ladder fuels are reduced to limit potential for spread into crowns; canopy fuels are reduced to limit potential spread between crowns and to maintain an overstory of large healthy trees, minimizing the potential for competition-induced mortality and creation of snags. The DFPZs are designed to: (1) reduce the extent of wildland fire severity by limiting the amount of area affected by wildland fire; (2) create areas where fire suppression efforts can be conducted more safely and effectively; (3) break up continuity of fuels over a large landscape; and (4) serve as anchor points for further area wide fuels treatments such as prescribed burning. Five DFPZs, averaging ¼ mile in width and located along major ridges, are included in each action alternative (Four Corners, Siskiyou Peak, Doe Peak, Siskiyou Gap and Cow Creek) (refer to Map 5). The objective of fuel modification within the DFPZs is to reduce fire behavior so that active crown fires moving into them drop to the ground and become surface fires.

The DFPZ prescription includes thinning from below (density control) favoring shade-intolerant, fire resistant species; thinning out the small diameter trees in the stand to reduce ladder fuels; and treating ground fuels using several methods as described below (Fuels Prescriptions) and in Table 2-5 General Thinning Prescriptions for Trees >9” DBH. Primarily smaller trees (<20” DBH) will be removed. Occasionally a tree 20” or larger would be removed. The circumstances where this would occur are: (1) when removal of a larger diameter white fir provides growing space for a vigorous, more fire resistant ponderosa pine or Douglas-fir; (2) when a tree shows obvious signs of insects, disease, or poor vigor which indicate that the tree is likely to die and become a snag; or (3) when the tree is identified as a safety concern for the operation. Scattered, larger, dominant Douglas-fir, ponderosa pine and sugar pine will be cultured throughout the stands by removing surrounding trees that are competing for sunlight, moisture and soil nutrients. Canopy closure would range from 30 to 60% depending on aspect and slope position. The greater canopy closure is desired where it

currently exists in order to maintain higher fuel moistures in surface fuels and reduce understory vegetation establishment and growth.

2.3.1.3 Fuels Prescriptions

Whole or Tops-attached Tree Removal

Whole tree removal is proposed as a fuels treatment in thinned stands with slopes <35%. This fuels treatment involves removing limbs and tops with the boles of trees that are thinned from the stand, which reduces the amount of fuel added to the forest floor during the thinning operation. The material is available for biomass utilization, or if not utilized, would be burned at disposal areas under wet conditions. Whole tree removal is an intermediate, mechanical fuels treatment and will be followed by a surface fuels treatment.

Tops-attached tree removal is similar to whole tree removal but may occur on slopes >35%. Tops-attached tree removal may include bucking the boles of trees into segments and leaving tops attached to the end segment.

Mastication

Mastication is proposed as an additional fuels treatment in stands with slopes <35% where there is a substantial number of small diameter trees (<8” DBH). Thinning and reduction of the ladder fuels is accomplished through the use of equipment with a rotary drum or grinding head (masticator). This fuels treatment will result in a change in the surface fuel bed as small trees are shredded or chipped into small pieces. Although mastication increases the amount of surface fuel available, the fuel bed is fairly compact and generally burns with lower flame lengths and slower rates of spread when compared to similar quantities of unmasticated fuels.

Hand Piling and Burning

Hand piling and burning of material is proposed in stands that will have a large number of small diameter trees remaining after the thinning has been accomplished. This treatment reduces the ladder and surface fuels and provides opportunities to underburn without incurring unacceptable levels of tree mortality. In many stands this fuels treatment will be followed by an underburn. Some stands are comprised primarily of smaller diameter trees, are small in size, or are not readily accessible. Hand pile and burn is the only fuels treatment prescribed in these stands.

Small Diameter Thinning in Riparian Reserves

Thinning out small trees (1”–9” DBH) and burning the piled material to reduce the ladder and surface fuels will also occur within Riparian Reserves (approximately 303 acres) where high levels of fuel loading were identified.

Broadcast Underburning

Broadcast underburning is proposed as a fuels treatment in stands with slopes >45%. Fires are intentionally lit under controlled conditions. Underburning reduces the surface fuels and ladder fuels by consuming fuel on the forest floor, killing smaller trees and pruning the lower limbs of larger trees. Where underburning is the planned fuels treatment, the treatment boundary will utilize riparian features as appropriate. Riparian areas will be utilized as a holding feature and prescribed burns will be allowed to back into the Riparian Reserve. Due to wetter conditions and higher humidity, the fire will go out when it gets into the riparian area. Underburning to the riparian feature may occur in 63 stands as identified on Maps 9, 10, 11, and 14 in Appendix A.

2.3.2 Conservation Measures

Integrated project design features are elements of the project that are included in all of the action alternatives and reflect conservation measures or Standards and Guidelines from the LRMP. Many of them reduce or avoid adverse environmental effects of the project.

2.3.2.1 Wildlife

The following conservation measures will minimize potential impacts to wildlife.

Northern Spotted Owls

- A seasonal restriction of February 1 to September 15 will apply to all activities that modify suitable NSO habitat (including activities that degrade or are beneficial) within 0.25 mile of an occupied activity center or unsurveyed suitable nesting/roosting habitat.
- A seasonal restriction of February 1 to September 15 will apply to all activities that remove/downgrade suitable NSO nesting/roosting and foraging habitat within a core area (0.7 mile of an activity center) or unsurveyed suitable habitat.
- A seasonal restriction of February 1 to July 9 will apply to all activities that create smoke or above ambient noise within 0.25 mile of an occupied activity center or unsurveyed nesting/roosting habitat.

- If protocol surveys indicate that historic activity centers and/or nesting/roosting habitat are not occupied by breeding NSOs, seasonal restrictions may be waived.

- The amount of NSO habitat affected by underburning annually will not exceed 35% of an active core area (0.7 mile radius) and 25% of a NSO homerange (1.3 mile radius).

- Silvicultural prescriptions for individual stands will be designed to minimize impacts to the primary constituent elements (PCEs) of NSO Critical Habitat ("…the physical and biological habitat features… that support nesting, roosting, foraging, and dispersal…" (50 CFR part 17)). Silvicultural prescriptions will focus on promoting the development of, and retaining PCEs at the stand scale. Temporary spur roads will be designed to avoid trees >20" where feasible.

Northern Goshawk

- A seasonal restriction of March 1 to August 31 will apply to all activities that modify (including activities that degrade or are beneficial) habitat within 0.5 miles or create smoke or above ambient noise within 0.25 mile of the flystain historic site or any additional nest sites that are discovered within the Project Area.

- If surveys indicate that the Flystain historic site is not occupied by breeding Goshawks, seasonal restrictions may be waived.

Pacific Fisher

- A minimum of 15% of each stand will be left untreated, leaving dense patches of cover for connectivity across the Project Area.

- Where possible, the untreated portions of stands will include the largest most structurally diverse trees in the stand, ensuring potential den and rest sites are retained.

Siskiyou Mountains Salamander

- Known, occupied Siskiyou Mountains salamander *(Plethodon stormi)* sites will be buffered by one site potential tree within which no overstory trees will be removed and no disturbance of talus or rock substrate will occur.

- No heavy equipment will operate on talus slopes regardless of survey results. Shaded talus with the potential to support Siskiyou Mountains salamander has been identified in stands 266, 288, 296, 321, 405, 481, and 739 but may occur in other stands; additional talus habitat located during layout will be flagged and avoided.

Tehama Chaparral, Siskiyou Sideband and Blue-gray Taildropper

- Stands within and adjacent to known sites (habitat areas) will retain ≥60% canopy closure within 170' of streams consisting of the larger or more mature trees and will meet Standards and Guidelines for coarse woody debris.

- Fuels treatments will be designed to minimize impacts to specific habitat components (downed woody debris [DWD], forest floor litter, canopy closure) important to the species' survival.
- No ground-based systems will be used within habitat areas and no heavy equipment will operate on talus slopes.
- Heavy equipment will not be used within 170' of streams and Riparian Reserve treatments will not reduce canopy cover, ensuring potential habitat within Riparian Reserves will not be removed.

Great Gray Owl

- A seasonal restriction of March 1 to July 31 will apply to all activities that create smoke or noise above ambient levels within 0.25 mile of unsurveyed suitable habitat (stands 250, 476, 477, 700, 701, 702, and 703).
- If surveys indicate that suitable habitat is not occupied by great gray owls, seasonal restrictions may be waived.

Snag Dependent MIS

- On DFPZs, large snags (>20") and groups of large snags will be retained unless hazardous to operations. If large snags (cull logs) need to be felled for safety reasons, they will be retained on site for large coarse woody debris.

Large Tree Character

- During temporary spur road construction, if any trees over 24" need to be felled, they will be left on site for coarse woody debris. To the extent possible, existing openings or corridors will be used for skyline yarding to minimize removal of large trees.

2.3.2.2 Water Quality

Best Management Practices

BMPs are water quality maintenance and improvement measures developed in compliance with the Clean Water Act, certified by the State Water Resources Control Board, and approved by the Environmental Protection Agency. The BMPs specific to this project are listed in Appendix D. They include Wet Weather Operation Standards, which will be governed by the *Wet Weather Operation Standards and Field Guide* (USDA Forest Service 2002a), which is incorporated by reference and on file in the project record.

Operating Period

Due to the relatively short dry-weather period at project elevations and native road surface erodibility, the Wet Weather Operation Standards (USDA Forest Service 2002a) will be mainly used to guide activities during the normal operating period from April 15 to October 15. If the Line Officer approves a contractor's request to operate outside the normal operating period, a project-specific wet weather operations plan will be developed prior to the end of the normal operating period. This plan will designate appropriate road winterization measures by road segment to prevent loss of material from the road prism to minimize the risk of non-point pollution.

2.3.2.3 Soils

Soil project design features were developed to ensure that the project has a high probability of meeting the Region 5 Soil Quality Standards and the KNF's Land and Resource Management Plan (LRMP) Standards and Guidelines (USDA Forest Service 1995a, 1995b).

The following soil resource design features are incorporated into the project design standards for Alternatives 2, 4, 5, and the Preferred Alternative.

- No more that 15% of a harvest unit should be disturbed by primary tractor skid trails, cable yarding corridors and landings.
- Eighty-five percent of a harvest unit must meet the Regional soil quality analysis thresholds for total porosity, soil displacement, soil organic matter, soil hydrologic function, erosion and soil buffering capacity.
- Reuse existing skid trails and landings whenever practical.
- No new constructed (full bench) skid trails will be created. Full bench skid trails will not be used to log slopes steeper than 35%. Any used existing constructed skid trail will be outsloped and water barred. Slash may also be used to provide additional erosion control as determined necessary by the timber sale administrator.
- Skid trail location will be agreed to by the FS.
- Skidding equipment will be generally restricted to slopes <35% and operate during dry soil conditions following the wet weather logging guidelines.
- Skid trails that connect benches in dormant landslide terrane can have minor portions of skid trails on slopes greater than 35%.
- In ground-based logging units, trees located on slopes >35% that can not be reached by skid trails on slopes <35% and/or by endlining will not be marked for harvest.

- In ground-based logging units, any marked trees that can not be reached with skid trails on slopes <35% and/or endlining will be left unharvested.
- Slopes steeper than 35% that occur in ground-based logging units will be logged by endlining from roads or skid trails. Ground-based logging equipment will be restricted to approved skid trails on ridges and flatter areas (<35% slopes) with endlining used between the skid trails.
- Skid trails in ground-based logging units within granitic terrane will not cross headwalls of swales.
- Main skid trails in units 220, 234, 337, 342, 343, 368, 709 and 756 will be subsoiled under dry soil conditions (dry down to 24 inches) with winged rippers to a depth of 18 inches before mastication.
- Track mounted masticators can operate on slopes up to 35% when soils are dry down to 10 inches.
- Minimize soil erosion by water-barring all skid trails, mulching with straw or fine slash (achieve 90%+ cover) the last 25 feet of all skid trails where they enter landings or roads where needed.
- Prevent road runoff from draining onto skid trails, cable yarding corridors or landings.
- New temporary roads would be built, used and closed in the same season of use (prior to winter)
- Retain existing levels or 5 logs/acre of coarse woody debris (logs) >20 inches diameter for soil productivity needs except where excessive numbers of downed trees creates a fuel hazard.
- Protect existing CWD by having skidding equipment and masticators avoid the larger diameter logs.
- Post-treatment total soil cover should range from 70-80% depending on slope steepness and fuel reduction treatments.
- At least 50% cover, as fine organic matter (<3 inch material), would be retained in all units.

Slope Restrictions for Equipment

Ground-based equipment will be restricted to slopes of <35%. On slopes >35%, ground-based equipment will use endlining from the skid trails. Track mounted grinding equipment and grapple equipment will be permitted on slopes up to 35%.

Skid Trails, Landings, and Skyline Corridors

No more than 15% of a treatment stand will be dedicated to primary ground-based equipment skid trails, skyline corridors, and landings. Existing roads, skid trails, and landings will be reused whenever practical. No new full bench skid trails will be constructed. The Wet Weather Operation Standards (USDA Forest Service 2002a) will be used to determine when to operate equipment on skid trails. Runoff will not drain from skid trails, skyline corridors, or landings into stream systems. Techniques to minimize soil erosion will include water-barring all skid trails and mulching the last 25’ of skid trails where they enter landings or roads with straw or fine slash to achieve 90% or greater cover. Landing maintenance will be conducted as necessary. Landings will be kept to the

minimum size needed for safe, economic operations. All landings will be shaped and treated for erosion control following use. Landings on the Siskiyou Crest Road will be returned to a condition free of visible debris and landform disturbances.

Masticating Equipment

Equipment such as a masticator will be used to grind up non-merchantable material in the stands shown in each Alternative (see Appendix A). This technique results in scattered wood fragments that serve as mulch. Mastication reduces ladder fuels and redistributes ground fuels, reducing or eliminating the need for burning. This type of fuels treatment causes the resulting wood fiber to decompose faster than if it remained in its original state. The equipment will have low ground pressure per square inch and minimal ground disturbance as it travels over the wood fragments it has created. Mastication will not occur within 170' of streams and will be restricted to slopes <35%. The masticating equipment will work perpendicular to the contour of the slope using the maximum boom reach to minimize ground disturbance. This equipment will cross Riparian Reserves only at pre-designated crossings.

2.3.2.4 Riparian Areas/Riparian Reserves

Thinning may occur in the upland in the outer 170'–340' of Riparian Reserves on less than 1% of the Project Area. There will be no timber harvest within Riparian Reserves in the first 170'. There will be no equipment in riparian areas (wet areas), riparian vegetation, or inner gorges. In some treatment stands, ephemeral draws (or summer-dry swales that transport snow melt) may be encountered that were not previously known or mapped in GIS. These ephemeral swales carry only snowmelt, not surfaced groundwater and are not classified as Riparian Reserves. If logs need to be skidded across these draws, skid areas will be designated by the timber sale administrator to avoid riparian vegetation and to minimize potential effects. Rehabilitation of skid trails or corridors may occur as discussed in the Conservation Measures for Soil.

The number of skyline corridors crossing Riparian Reserves associated with water will be limited. If a corridor must cross a Riparian Reserve, an earth scientist and/or timber sale administrator will designate the crossing and logs will be fully suspended over the inner gorge. In general, tying off across a stream is a method used to increase deflection for cable yarding; logs are not usually carried over the Riparian Reserve, only the carriage or the mainline cable cross the creek. Skyline corridor locations above Riparian Reserves will be selected to avoid damage to canopy.

Hand piles will be placed to protect Riparian Reserves during fuels treatment. Areas with soil cover <60% will not be hand piled. To avoid burning large areas, hand piles will be distributed so they are isolated and do not connect.

2.3.2.5 Fire/Fuels

Burn Plans will be designed to achieve burn objectives, while minimizing the biomass consumed. This is generally accomplished by burning at high fuel and duff moisture levels, which limits the burning of large stumps and coarse wood and maximizes consumption of smaller-sized fuel. Spot weather forecasts will be used to ensure favorable "within prescription" weather conditions for the burn and for smoke transport.

2.3.2.6 Air Quality

Smoke management plans will be submitted to the Siskiyou County Air Pollution Control District for each burn plan.

Burning will occur during favorable weather conditions when smoke is transported away from sensitive locations. This can be accomplished by burning handpiles above fall or winter inversion layers. Spring burning has advantages of higher fuel and ground moisture, atmospheric instability, and good transport winds. Fall and winter burning can restrict emissions and smoke to the ground level if burning takes place under the inversion layer. Contingency actions will be undertaken if smoke impacts occur or meteorological conditions go out of prescription. For example, ignitions will be slowed or stopped if changing meteorological conditions cause smoke to intrude into sensitive areas, or burning may be undertaken on low visitor use days in the spring and avoided on high use weekends.

Hand piles in all action alternatives will be constructed to burn with minimal smoke. Techniques include covering piles to keep them dry and limiting the amount of soil in the piles.

2.3.2.7 Sensitive Plant Species

The two known populations of *Ptilidium californicum* (PTCA5) within Stands 465 (and adjacent to Stand 300) and Stand 284 will be buffered the equivalent of one site tree height in distance (170'). This buffer is an area in which no variable density thinning (>9") will occur. Within this buffer, small diameter trees will be thinned/hand piled/burned to within 25' of the population. There will be no ground disturbing activities of any kind within 25' of the population.

2.3.2.8 Sensitive Fungi and Bryophyte Species

Existing resource protection measures designed to protect fish and water resources will provide benefits to the Sensitive plant species of concern also. The habitat for the sensitive fungi and bryophyte species occurs within the wetter environments of riparian areas and the forested stand within 25' of the riparian vegetation. Riparian Reserves have been established 170' on either side of non-fish bearing streams. The Riparian Reserve adjacent to fish bearing streams is 340' on either side. Project activities will be limited within these areas. The objectives of these protection buffers are to maintain existing shade and moisture levels, litter, duff, and coarse woody debris components, and species composition. Retention of these components within the buffers will provide continued high quality habitat for the Sensitive fungi and bryophyte species of concern.

2.3.2.9 Scenic Quality

Project design features for maintaining and improving scenic quality are incorporated into treatment prescriptions and are described in Appendix E. Scenic quality design features are incorporated to ensure compliance with LRMP Visual Quality Objectives within Viewsheds of Concern and to perpetuate the valued scenic character**.** Scenic quality design features will minimize impacts to scenery along the Pacific Crest Trail, the Siskiyou Crest Road (20), Interstate 5, 40S16 Road and the 40S15 Road. The project landscape architect shall be consulted or involved during planning and layout of these design features.

2.3.2.10 Heritage Resources

The following heritage resources conservation measures will be incorporated into the any actions:

- Archaeological objects or known cultural sites of archaeological significance or cultural importance will be protected by flagging and avoiding sites.
- Underburning at low intensity will be allowed through Site #181 (Oregon trinomial 35JA00704) and is not expected to have significant negative effects on the site. Post-project monitoring will occur at this site.
- Site #85 (Oregon trinomial 35JA00695) will be protected by placing logs parallel and within the ditch and at a height level with the rim of the ditch at any proposed crossing sites.
- Any other objects or sites discovered during implementation will be protected, including: historic or prehistoric sites, buildings, objects, and properties related to American history, architecture, archaeology, and culture. The USFS will modify or cancel a contract to protect an archaeologically significant cultural area, object of antiquity, artifact, or similar object. The operator is required to promptly report any new discovery.

2.3.2.11 Noxious Weeds

The on-going inventory and monitoring of noxious weeds will continue in the Project Area, as on other parts of the District. New locations or species of concern will be incorporated into mitigation measures as necessary. In addition:

- All project-related equipment will be cleaned prior to its entry onto National Forest System Lands to reduce the potential for spread of noxious weed seeds.
- Wherever seed and/or straw is used to restore areas of ground disturbance, certified weed free seed and straw will be used.

2.3.2.12 Public Safety and Information

- Prior to beginning operations, the operator and USFS will agree to a Traffic Control Plan that provides for public safety on USFS controlled roads and trails open to public travel.
- Hazard tree removal, a non-discretionary action, will meet Occupational Safety and Health Act standards for hauling, landing use, tree falling, and associated actions. This will include trees used as guylines and tailholds in skyline yarding systems. The *Klamath National Forest Hazard Tree Guidance* (USDA Forest Service 2001a), which provides criteria for the identification and removal of hazard trees, will be followed. Hazard trees removal operations within Riparian Reserves will adhere to provisions in the Letter of Concurrence Regarding Hazard Tree Removal from the National Oceanic and Atmospheric Administration - Fisheries (USDC NMFS 1997).
    - Roads and trails open to the public will be kept open or only closed for short durations. Management of project activities will be designed to minimize conflicts with public use on weekends and holidays.
    - Dispersed campsites will be maintained in a usable condition if possible, however they are not protected nor managed as developed sites.
    - Warning signs will be posted on the PCNST during any adjacent project activities. Any damage to the trail will be immediately repaired.

2.3.3 Monitoring

The following monitoring would take place with the execution of this project.

- **Implementation Monitoring** would assess whether the project was implemented as designed and whether it complies with the LRMP. It is part of the administration of all projects implemented under contracts or by USFS crews. Consultation with resource staff specialists occurs frequently during project implementation. These specialists provide technical advice when questions arise during project implementation.

- **BMP Monitoring**–Forest staff conduct annual concurrent BMP monitoring of projects, and implementation and effectiveness monitoring on a representative sample of projects for water quality management. Refer to Appendix D for a list of applicable water quality BMPs. The results of this monitoring are summarized in an annual BMP monitoring and evaluation report (USDA Forest Service 2007a).

- **Soils**–Upon completion of restoration activities, monitoring will be completed to evaluate how well the project met the Region 5 Soil Quality Standards and LRMP soil guidelines. Three stands that are to be treated using ground-based heavy equipment will be monitored for Region 5 Soil Quality Standards. Three underburn, and one handpile stand will be monitored for soil cover. Six additional units, including three subsoiled units will be monitored.

- **Scenery Evaluation**–A landscape architect will monitor project implementation for consistency with Visual Quality Objectives.

- **Fuels and Fire Monitoring**–Upon completion of project activities, monitoring will be conducted to assess the positive or negative effects of fuels treatments. Monitoring can be completed by the Forest and/or interested stakeholders (multi-party monitoring). The immediate (1–3 years post-project) and long-term effects on landscape attributes would be monitored using a fire effects monitoring and inventory system (e.g., FIREMON). Monitoring will be used to (1) document basic information during different phases of the project, (2) establish changes in attributes and trends through time, (3) analyze short and long-term fire effects, and (4) determine if project objectives related to fuels were met. Monitoring will be conducted according to the *Klamath National Forest Fuels and Fire Effects Monitoring Guide* (USDA Forest Service 2007b). Pre-project field data, to be used for monitoring, was collected in 2004 using Forest Inventory and Analysis (FIA) plots (USDA Forest Service 2007c). Post-project data will be collected in established plots and input into the monitoring database at intervals established by the project monitoring plan. Monitoring will be subject to available funding and the ability of stakeholders to contribute funds or in-kind services.

- **Noxious Weed Inventory and Monitoring**–The on-going inventory and monitoring of noxious weeds will continue on the Forest. The Project Area will be monitored, as part of the Forest noxious weed program, for three years after the project is completed or as long as it takes the vegetation to recover from the disturbance (as measured by ground duff cover and forb and shrub layer cover). New locations or infestations of concern will be incorporated into mitigation measures as necessary.

- **HFRA Monitoring**–Section 102(g)(1) states that the USFS will monitor a representative sample of projects. Implementation of the project will be reported as part of the established HFRA reporting process (fuels reporting) and information will be available for selection as part of the representative sample to be monitored by the Secretary of Agriculture.

- **Wildlife**–Occupancy and reproduction of NSOs at historic sites within the Project Area will be monitored during and up to three years after project implementation. All known Siskiyou Mountains salamander sites will be monitored up to three years after project implementation to evaluate the effectiveness of the Project Standards and Guidelines to protect these sites.

2.4 Alternatives Considered but Eliminated from Detailed Study

Some alternatives eliminated from detailed study were identified during the early planning process; others were identified in public comments received in response to the Proposed Action. These alternatives were outside the scope of the project, do not achieve some aspect of the Purpose and Need, are duplicative of the alternatives considered in detail, have components that will cause unnecessary environmental harm, or are not feasible. A number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

2.4.1 Treatment on 5,577 acres – Maximum Treatment Alternative

Based on identification of mid-successional stands in need of thinning (*Mt. Ashland Late Successional Reserve Assessment* [USDA Forest Service 1996a] and *KNF Forest-wide Late Successional Reserve Assessment* [USDA Forest Service 1999]), preliminary treatment prescriptions, and yarding system information, a preliminary proposal of about 5,577 acres was developed. It included thinning and removal of understory vegetation in some areas to reduce stand density and a variety of treatments to reduce fuels. Through the thinning and fuel reduction, a number of DFPZ (shaded fuel breaks) would be created.

The analysis team hosted a field trip to the proposed Project Area on September 29, 2004. The objective was to involve interested members of the public early in the planning process and ask for help in developing a Proposed Action, using the preliminary proposal as a starting point. Input on the preliminary proposal was requested from the field trip attendees, either at the meeting or to be mailed later. Discussions tended to focus on harvesting and fuels treatment methods. Considerations identified by the attendees were used to develop the Proposed Action include minimizing harvesting and fuels treatments that use ground-based equipment, maintaining shade for streams, favoring species that were more abundant historically (e.g., pine), and using the right tool to complete work efficiently.

The preliminary proposal included treatment in some older forest stands and in high elevation true fir stands. Following site specific review, it was determined that many of these stands either did not need treatment to meet the Purpose and Need of the project or would not respond well to treatment.

2.4.2 Treatment on 5,063 acres

This is the original Proposed Action that was described in the scoping letter of October 3, 2005 and in the Notice of Intent published in the Federal Register on October 7, 2005. This alternative includes 70 acres of early-successional forest thinning, 2,547 acres of mid-successional forest thinning, 1,714 acres of strategic fuel break treatments, 412 acres of hand thinning and fuels treatments in Riparian Reserves, 268 acres of underburning, and 50 acres of fuels treatments in late-successional forest. This alternative was not studied in detail because field reconnaissance and validation of tree removal systems found that some of the original stand boundaries and proposed tree removal systems were infeasible as planned or had the potential for detrimental soil impacts.

2.4.3 Use Ground-Based Systems Only

This alternative limited the treatments to slopes <35% where ground-based systems could be used, thereby limiting the acres of fuels and habitat restoration/promotion treatments. Overall effectiveness of treatments was reduced because so little of the Project Area could be treated (approximately 30%); the alternative did not sufficiently meet the Purpose and Need. Also, the alternative may not have met Standards and Guidelines for soil and water resources.

2.4.4 No Tractor Yarding

This alternative was proposed in a discussion during the public field trip on September 29, 2004. This alternative proposes that all tree removal or yarding be done using a helicopter or skyline system. Helicopter yarding is expensive and generally used only where ground-based options are not available. Costs for helicopter yarding are almost three times that of ground-based equipment and skyline yarding is twice the cost of ground-based equipment (Bailey pers. comm.; Young 2006). Historically, timber sales on the Forest that are helicopter/cable only have not sold due to high costs and low or non-existent profit margins (Little North Fork, Taylor LSR Project, Woody Heli Fire Salvage, Garden Gulch LSR Project). Recent increases in fuel costs have further increased costs of helicopter logging. In addition, the availability of helicopters in the late summer for project work is limited due to the need for helicopters for fire suppression (Blessing pers. comm.). If the project cannot be implemented, the outcome will be the same as for the No Action Alternative. Habitat restoration treatments and fuels treatments will not occur. A No Action scenario does not meet the Purpose and Need.

2.4.5 Alternative 3 – No Temporary Spur Road Construction

This Alternative proposed no temporary spur road construction. It proposed treatments on 4,607 acres in 258 stands with 322 more acres of helicopter yarding than the Proposed Action. Temporary spur road construction was minimized in both Alternatives 4 and 5. Alternative 3 is duplicative of Alternatives 4 and 5, and addresses the same significant issues as Alternative 5. A preliminary comparison of alternatives and effects concluded that Alternative 5 met the Purpose and Need as well as or better than Alternative 3 with about the same effects on water quality. Initial economic analysis showed that Alternative 3 would require significantly more financial input, beyond appropriated dollars, than the other action alternatives. Although it is anticipated that outside funds will be needed to complete the project, Alternative 3 would require funding so much in excess of the other action alternatives that it may not have been possible to implement. If the project cannot be implemented, the outcome will be the same as for the No Action alternative. Habitat restoration treatments and fuels treatments will not occur. A no-action scenario does not meet the purpose and need.

2.4.6 Variable Density Thinning of Trees Less than 20” in Diameter with Hand Treatment of Fuels Alternative

This Alternative was proposed in the combined scoping letter from Klamath Siskiyou Wildlands, Environmental Protection Information Center, Cascadia Wildlands Project, Klamath Forest Alliance and Siskiyou Regional Education Project.

This alternative proposes variable density thinning of trees less than 20” in diameter, hand treatment of ground and ladder fuels in Riparian Reserves, and underburning, hand piling, and lop and scatter fuels treatments in and near treatment stands. For the purposes of this assessment, we assumed that helicopter yarding would be used in treated stands without road access and no temporary road construction would occur.

This alternative mirrors the action alternatives in its proposal of variable density thinning of trees less than 20”, and its use of underburning and hand-piling to treat fuels. This alternative differs from the action alternatives in that it does not include a DFPZ, nor does it propose using a masticator to treat fuels. The DFPZ prescription is intended to limit the amount of area affected by wildland fire, create conditions under which fire suppression efforts can be conducted more safely and effectively, and create anchor points for further area-wide fuels treatments such as prescribed burning. Eliminating the DFPZ generates safety issues for firefighting personnel, and complicates future underburning efforts.

Using a masticator on slopes <35% is 15%–25% less costly than hand-piling methods. Hand-piling also incurs the additional cost of re-entry to burn hand-piles. Lop and scatter treatment of fuels in variable density thinning stands (trees >9”) would create a deep fuel bed that can adversely affect tree survival during subsequent prescribed burns or wildland fire; lop and scatter will not meet the need to reduce fuels in the Project Area. While all three methods of fuels treatment can be effective, manual methods become less effective, and are very time and labor intensive, in areas of heavy fuels (such as many units in the Project Area). Hand-piling instead of mastication on slopes less than 35% would require more financial input for less efficient treatments.

The effects of an alternative that does not include temporary road construction were addressed under Alternative 3 and partially under Alternative 5 and the Preferred Alternative. The action alternatives considered in detail (2, 4, 5 and the Preferred Alternative) address the impacts of variable density thinning and manual fuels treatments. Elimination of the DFPZs would not meet the purpose and need for the project to reduce the threat of catastrophic wildfire.

2.5 Comparison of Alternatives

This section compares the alternatives considered in detail based on information provided in Chapter 1 (purpose and need, significant issues) and Chapter 2 (elements of the alternatives). Information in Table 2-6, *Comparison of Alternatives*, is focused on activities and treated acres where different levels of treatment can be distinguished quantitatively among alternatives.

Table 2-6 Comparison of Alternatives

Effect or Output	Alternative 1	Alternative 2	Alternative 4	Alternative 5	Preferred Alternative
Acres of habitat treated to promote growth and restore late-successional forest (early and mid-successional forest)	0	2,997	2,487	2,987	2,951
Percent of early and mid-successional habitat acres treated to reach desired amount of late-successional/old-growth habitat in the Project Area	0%	81%	66%	81%	80%
Acres of treatment to develop a DFPZ and reduce wildfire threat	0	1,286	1,275	1,202	1,058
Acres of fuels treatment to reduce ground and ladder fuels, both activity and natural	0	4,706	4,185	4,612	5,765
Underburning acres (subset of fuels treatments above)	0	1,502	1,438	1,528	3,369
Percent of Project Area (acres) treated to reduce ground and ladder fuels including habitat treatments and DFPZs above (precommercial thinning, Weed and Clean)[1]	0%	34%	30%	33%	41%
Fire Regime Condition Class (FRCC): Percent of treatment area that is severely departed (CC 3) from historic conditions using vegetative structure (FRCCvs) and fire return interval (FRCCfri)	FRCCvs: 0% FRCCfri: 0%	FRCCvs: 38% FRCCfri: 85%	FRCCvs: 37% FRCCfri: 85%	FRCCvs: 38% FRCCfri: 85%	FRCCvs: 39% FRCCfri: 90%
Acres of ground-based yarding to remove trees	0	1,202	965	1,065	1,056
Acres of cable yarding to remove trees	0	1,602	1,528	1,471	1,610
Acres of helicopter yarding to remove trees	0	1,071	861	1,245	935
Acres of mastication to reduce fuels	0	1,245	946	1,120	1,037
Acres of land potentially affected by new landing construction	0	25	22.5	21	22
Miles of temporary spur road construction	0	6.86	4.96	2.27	1.70

1Acres of small diameter, precommercial thinning, mastication, hand-piling and underburning within all stands within the Project Area.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, economic, and social environments of the Project Area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2.

Analysis methods are discussed for each resource, followed by a description of the affected environment, or resource description. Following each resource description is a discussion of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. All significant or potentially significant effects, including direct, indirect, and cumulative effects, are disclosed. Effects are quantified where possible, and qualitative discussions are also included. Design features to reduce or mitigate potential adverse effects are described.

The discussions of resources and potential effects take advantage of existing information included in the LRMP EIS, Beaver Creek Ecosystem Analysis (USDA Forest Service 1995b, 1996b), and other sources as indicated. This EIS is tiered to the LRMP EIS (USDA Forest Service 1995b). Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information such as resource reports, ecosystem analyses, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record, located at the Supervisor's Office in Yreka, California, is available for review during regular business hours. Information from the record is available upon request.

The proposed Project Area consists of approximately 13,939 acres. This area is north of the Klamath River in Upper Cow, Deer, Grouse, Long John and Headwaters Cottonwood Creeks. Only information necessary to understand the environmental consequences is included in the affected environment discussions in this document. More detailed information on the affected environment including ecological relationships can be found in Chapters 1 though 5 of the Beaver Creek Ecosystem Analysis (USDA Forest Service 1996b), which is incorporated by reference.

Environmental consequences are the effects of implementing an alternative on the physical, biological, economic, and social environment. The Council of Environmental Quality regulations implementing the NEPA include a number of specific categories to use for the analysis of environmental consequences. Several form the basis of much of the analysis that follows.

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would occur in the foreseeable future.

Cumulative effects result from the incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past, present, and reasonably foreseeable future actions are assessed along with the effects of the Proposed Action and alternatives to determine whether significant cumulative effects may occur. This analysis is consistent with the Council on Environmental Quality memo from James L. Connaughton (2005) titled "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis" dated June 24, 2005, which is incorporated by this reference.

Analysis areas vary by resource, and so do the other actions included in each cumulative effects analysis. Cumulative effects may include estimated effects from past and present private logging operations (including harvesting, roads, and landings), past USFS logging, and roads. Private logging includes past and present timber harvest plans (captured from orthophoto quadrangle review and timber harvest plans submitted by private logging companies) as displayed in Appendix B. Other actions on federal lands that are within some resource analysis areas are precommercial thinning, road maintenance, grazing, hunting, and off-road vehicle use. One grazing allotment extends into the Project Area (East Beaver). Private residences, which include private access roads, are found south of the Project Area in the Beaver Creek watershed.

Much of the Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in analysis of these data. The data are available in tabular (numerical) and map formats. Many specialists' reports provided the background for the analysis summarized in this FEIS. These reports are incorporated by reference and available in the project file, which is located at the KNF Supervisor's Office in Yreka, California.

The ecology, inventory, and management of a large forest area is a complex and developing science, but the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences.

3.1 Vegetation

This section mainly discusses major conifer covertypes. Weed species are discussed briefly. For a discussion of special status plant species please refer to p. 3-166.

3.1.2 Analysis Methods

The effects of each alternative on vegetation within the Project Area are identified below. How well each alternative would move stands toward the Desired Conditions is highlighted in the discussion. All of the stands identified for thinning treatments (habitat promotion and DFPZs) received an on-site review by a certified silviculturist and a wildlife biologist. Field data (site class, canopy closure, BA, trees per acre, snag densities, stand density, and dwarf mistletoe infection level) were collected from a representative sample of stands in each of three categories: north and east slopes mixed conifer, south and west slopes mixed conifer, and true fir. Stand diagnosis and site-specific prescriptions were developed based on information from field review.

Stand dynamics were modeled using the Forest Vegetation Simulator (FVS). The FVS model incorporated data collected from the field. The modeled results from FVS display relative trends in stand development for each of the defined categories and are best used to make comparisons between alternatives. Model results are not intended to be absolute values. Wildlife biologists will work with the marking crews to ensure that specific stand attributes will meet project objectives post-treatment.

It is important to note that models are only able to approximate natural processes and most models are inherently inexact. Thus, it is essential to understand the model limitations when assessing or analyzing model results. Although the FVS models are developed from actual stand data, stand attributes within the three categories are averaged before predictive models are created. Therefore, the existing within-stand variability is not captured in the modeling process. Additionally, the FVS model applies a silvicultural treatment uniformly across a stand and cannot model more complex treatments such as the variable density thinning prescriptions and habitat retention standards proposed in this project. Thus, the FVS model does not incorporate the untreated areas within a stand. These no-cut areas would have slower growth, greater canopy closure, higher mortality and an increasing build-up of fuels. There would be an effect on vegetation surrounding the uncut patch in the form of reduced growth and increased fire hazard. Plant aggregations within treated stands where only trees less than 9” are growing are generally removed from the stand (thinning from below) in the model yet in reality they would receive a pre-commercial (small diameter) thinning treatment and many of the stems would be retained as an integral part of the resultant stand. All of these

nuances within the treated stands would occur on the ground but are not well reflected in the modeling results.

Despite these limitations, the FVS model is still a powerful tool in that it simulates tree and stand growth over time using site-specific data on tree species, forest type, and stand condition. The FVS model can also be calibrated to specific geographic areas. Stand development was modeled for a fifty-year period, which is adequate time to display the differences on stand development between treating and not treating stands in the Project Area.

Supporting documentation for the discussions in the Vegetation Section include the Silviculture Report (Varak 2007), and Stand Record Cards (Varak 2007). These documents are incorporated by reference and available in the project file. The documentation provides the descriptions, detailed discussions, assumptions, and figures that support the discussions in this section.

3.1.3 Affected Environment

The analysis area for vegetation is synonymous with the Project Area as displayed on Map 4 in Appendix A, and includes the Beaver-Grouse and Long John sub-watersheds and portions of the Upper Cow, Deer-Beaver and Headwaters of Cottonwood Creek sub-watersheds. The project lies on the south side of the Siskiyou Crest with elevations ranging from 3,200 to 6,500 feet.

As a result of past management actions (refer to Map 12), stands in the Mt. Ashland LSR Project Area are in the early to mid-successional stages and lack structural diversity. Railroad logging in the early part of the 20th century removed over 90% of the large trees from the original stands. Large pines were the desired species to make boxes for citrus fruit shipping. Douglas-fir also was removed. While smaller trees were not harvested many were destroyed during the logging, leaving the stands very poorly stocked. The area reforested naturally via seed cast from trees that remained. Later timber harvest included sanitation of dead and dying trees, which was a common harvest prescription in the 1940s. Unit Area Control (UAC) was a prescription implemented in the 1950s. Thinning, individual tree selection, sanitation, and small group selection openings were intermixed across the hillside in the UAC prescription. Starting in the 1960s, clear-cutting was a frequently chosen prescription. Partial cutting was resumed in the 1970s until even-aged management prescriptions (clear cuts) were again implemented in the 1980s and 1990s. All of the past harvest focused on removal of larger trees in the stands with little small-diameter thinning to remove undesirable sub-merchantable stems. The result is that the Project Area consists of 80 to 90 year old stands with few, if any, large diameter trees. There are numerous 5–15 year old seedling, or pole-sized even-aged, conifer plantations.

The composition of the vegetation is influenced by the elevation. No noxious weeds are known to occur within the Project Area boundary. At the upper elevations (generally above 6,000') forested stands are primarily red fir with incidental occurrence of mountain hemlock. Between 5,000 and 6,000', the true fir stands are a mix of red fir and white fir. White fir becomes more dominant as elevation decreases. Approximately 35% of the Project Area occurs within true fir zone.

Mixed conifer forest types are found at the mid and lower elevations (generally below 5,200'). Aspect strongly influences stand composition with Douglas-fir and white fir dominating the north and east facing slopes. The pine species, incense cedar, and Douglas-fir are more commonly found on the south and west facing aspects. In the absence of naturally occurring low intensity wildfires due to fire suppression, the amount and distribution of white fir has significantly increased.

Soils within the Project Area are considered productive (Forest Survey Site Classes 2–4). Productivity is linked to the availability of water and nutrients, which affect overall stand vigor and growth. The availability of moisture is the most limiting factor for conifer survival and growth. Annual precipitation is around 45"–55", with about 90% occurring between October and May. At the higher elevations, the precipitation is predominantly snowfall.

Stand density influences the amount of water, nutrients, and sunlight available to individual trees. High stand density, such as that found in the Project Area, leads to competition for limited resources needed for growth and survival. Competition, in turn, leads to reduced growth and vigor, increased susceptibility to insects and disease, and to mortality. Stand density affects stand health and the ability of trees to respond to disturbance mechanisms. High tree densities lead to increased competition for the limited resources needed to remain alive and growing. Weakened trees are more likely to succumb to the effects of disturbance mechanisms such as disease, insects and fire.

The SDI is a relative measure of stocking levels expressed as a number of 10" DBH trees per acre. Reineke (1933) first introduced SDI as a measure of site occupancy. He found that SDI could be consistently applied to calculate a maximum density expected for a given average stand diameter. SDI has an advantage over BA because it is not significantly affected by age and site quality. Maximum SDI values have been developed for a variety of species including red and white fir, ponderosa pine and Douglas-fir. The maximum SDI value for each species is 800, 759, 571, and 547, respectively.

A zone of imminent mortality, or where self-thinning begins to occur, is reached at 55% of maximum SDI. This would equate to SDI values of 440 for red fir, 417 for white fir, 314 for ponderosa pine, and 300 for Douglas-fir. Recent research in red fir stands in northeastern California found a strong correlation with SDI values and tree mortality (Zhang et al. 2005).

In order to minimize self-thinning and associated fuels build-up, and to promote growth, stands should be below 55% of maximum SDI (Reineke 1933) (See Table 3-1 on p. 3-15 for current SDIs in the Project Area). Since all the stands are above 55% of maximum SDI, mortality is occurring and fuel loading is increasing. As shown in Figure 3-1 and Figure 3-2, there are few, if any, large trees and the stands are overstocked. Figure 3-3 depicts the mortality that is occurring and how fuel loads are increasing.

Figure 3-1 Overstocked mixed conifer stand in the Mt. Ashland LSR Project Area

Figure 3-2 White fir encroachment in the Mt. Ashland LSR Project Area

Figure 3-3 High fuel loading from insect mortality in a mixed conifer stand

3.1.3.1 Desired Conditions

The stands in this Project Area have been designated as LSR, Management Area-5 (USDA Forest Service 1995a). Management goals are to protect and enhance conditions of late successional and "old growth" forest ecosystems. Management direction emphasizes accelerating development of late successional conditions while making the future stand less susceptible to natural disturbances (ibid.).

All of the stands proposed for thinning treatment are currently in either an early-successional stage (stands averaging less than 10" in diameter) or a mid-successional stage (stands averaging 11"–24" in diameter). Post-treatment, these same stands would be in the high end of a mid-successional stage (larger average stand diameter) or the low end of a late-successional stage (smaller average stand diameter for that stage but with diameters greater than 24"). Based on computer generated simulations it would take these same stands 50 or more years to grow to these average diameters without silvicultural treatments (USDA Forest Service 2006b).

For these lands, healthy stands within the three categories would exhibit the following characteristics:

- Insect and disease levels such that mortality is not substantial (snag and coarse woody debris levels are within Forest standard and guidelines).
- Average DBH of habitat promotion stands is greater than 24”
- Stands are below 55% of maximum SDI which would equate to SDI values of less than 440 for red fir, 417 for white fir, 314 for ponderosa pine, and 300 for Douglas-fir
- Mixed conifer stands on north and east slopes consist of structurally diverse, late successional conditions with canopy closure greater than 60% on the lower slopes and 40%–60% on the upper slopes. Douglas-fir is the dominant species with lesser amounts of ponderosa pine, sugar pine, and incense cedar. There are gaps created by natural mortality where early-successional vegetation is present. There are between 35 and 50 trees >24” DBH per acre. Desired BA is in the range of 120–150 ft^2 per acre post-project and would increase to 245–280 ft^2 when stands reach 150–200 years of age. Dense patches of trees will be intermixed with these stands on 10%–20% of the landscape (variable density). This will allow for areas of higher stocking, higher levels of mortality, undisturbed debris, and size differentiation (USDA Forest Service 1999).
- Mixed conifer stands on south and west slopes are generally open grown with canopy closure ranging from 40%–60%. Due to more intense fire behavior on steep slopes the upper one third to one half of the slopes may have as little as 25% canopy closure. The stands will be single layered. There will be gaps created by natural mortality where early successional vegetation is present. Trees of various age will be scattered over the landscape on these aspects, but a majority of the stands will contain late mature to old growth characteristics. Ponderosa pine would be the dominant conifer species, but will be intermixed with Douglas-fir, sugar pine and incense cedar. There are between 30 and 45 trees >24” DBH per acre. Desired BA is in the range of 120–150 ft^2 per acre post-project and would increase to 210–245 ft^2 per acre when stands reach 150–200 years of age. Dense patches of trees will be intermixed within these desired ranges over 10%–20% the landscape.
- True fir stands consist of structurally diverse, late successional conditions with canopy closures at or above 60% regardless of aspect or slope position. There are between 25 and 50 trees >24” DBH per acre. Desired BA is in the range of 150–200 ft^2 per acre post-project and would increase to 210–300 ft^2 when stands reach 150–200 years of age. To provide diversity, 10%–20% of the landscape within this vegetative type should have denser stocking levels, approaching 90%–100% of normal. This would allow for the higher stocking levels, higher levels of mortality, undisturbed debris and size differentiation (USDA Forest Service 1999).
- The desired stand conditions for the DFPZs would be the same as the category stand type in which it is found (i.e., north and east slopes, south and west slopes, or the true fir zone) but, because of their location on the top of ridges, with the following emphases: surface fuels are reduced to levels that generate low fireline intensity; ladder fuels are reduced to limit potential for spread into crowns; and canopy fuels are reduced to limit potential spread between crowns and to maintain an overstory of large healthy trees, minimizing the potential for competition-induced mortality and creation of snags.

3.1.3.2 Disturbance Mechanisms

Stand health is also shaped by the types and amount of disturbance the stand has experienced over time. Fire, insects, and disease, as well as past management actions, are all mechanisms which influence stand health.

Forest pests occur naturally in stands within the Project Area, most commonly fir engraver and western pine beetles. As stand density and inter-tree competition increases, mistletoe infection increases. In the absence of other disturbance, such as fire, an environment favorable to increased insect infestation is provided. Decreased availability of soil water, such as occurs in dense stands, reduces a tree's ability to pitch out attacking insects. Trees weakened by disease have similar difficulties. Increasing density and competition within stands in the Project Area will encourage increasing insect mortality in trees. Detailed descriptions of fire, dwarf mistletoe, fire engraver beetle, and western pine beetle are given on the following pages.

Fire

Fire is an important disturbance mechanism in these stands. The Project Area is considered to be in a mixed severity fire regime [i.e., a fire would naturally result in an average reduction of the BA of the dominant vegetation by 20%–70% (Agee 1993)]. Within a mixed severity regime, some areas would burn at a low intensity with minimal mortality; other areas would burn with moderate intensities; and still other areas would burn at high intensities, killing more than 75% of the dominant vegetation. The high intensity type fires will leave a mosaic of open ground with scattered pockets of timber. Stands burned at high intensity would not meet objectives for multi-layered, dense, closed-canopy forest.

The amount of area burned at the different intensity levels is influenced in part by the length of the fire free interval. Long periods without fire result in conditions more conducive to higher intensity fires as ground fuels accumulate, ladder fuels develop, and stand densities increase. No large fires have burned in the Project Area since the railroad logging era (early 1900s). The long fire-free interval has resulted in dense growth of poles and saplings (ladder fuels) and accumulations of ground fuels. Fire as a disturbance process is discussed in detail in Fire and Fuels section on p. 3-21.

Dwarf Mistletoe

Dwarf mistletoe (*Arceuthobium* spp.) is commonplace throughout the Project Area and has a definite influence on stand health. Dwarf mistletoe is a host-specific parasitic seed plant. Evidence of mistletoe infection was found in the major conifer species that are present in the Project Area (Douglas-fir, white fir, incense cedar, ponderosa pine, and red fir), indicating that several different

dwarf mistletoe species are present. Plot data was taken across the Project Area to provide overall stand conditions including mistletoe presence along with individual stand data taken when preparing individual stand diagnosis (See Table 3-1 p. 3-15).

Geils and Hawksworth (2002) found that although dwarf mistletoes do not provide large incentives for birds or mammals to visit for pollination or seed dispersal as do other mistletoes, dwarf mistletoes provide forage, foraging sites, protected and special sites, and desirable stand structures for numerous wildlife species. However, he further determined that mistletoe presence, incidence, and severity may not be good indicators themselves of wildlife habitat value.

Dwarf mistletoe is an endemic disease; however, the amount and intensity is now greater than it was 100 years ago (Mathiasen pers. comm.). Mistletoe severity is usually described by a relative index for the amount of host crown affected (Hawksworth et al. 2002). The six-class dwarf mistletoe rating system, Hawksworth dwarf mistletoe rating (DMR), developed by Hawksworth in 1977 is a commonly used method of rating mistletoe infection. The anticipated half life of a tree with a DMR 6 is about ten years (Hawksworth and Geils 1990). Upon reaching DMR 3, diameter growth begins to slow and is reduced by 50%. In Douglas-fir, height growth is reduced at all infection levels and by 15%–25% in DMR classes 3–5 (Hawksworth and Weins 1996).

Current inventory data indicates an average DMR of 2–3 for trees that presently have mistletoe within the Project Area. The disease could intensify to a DMR 6 over the next 40 years. Tree growth reduction would begin in the next ten or so years and continue to decline over the next 30 years. Thus, it is unlikely that the tree would reach 20” DBH before succumbing to the mistletoe, or to the combined effects of other pathogens and insects to which mistletoe-infected trees are predisposed. Thinning to reduce competition between trees can slow the growth of mistletoe. Thinning in stands with a DMR <3 is practical (Muir and Geils 2002).

Fir Engraver Beetle

The fir engraver *(Scolytus ventralis)* attacks most true fir species in the western United States. The attacks by this under-the-bark burrowing beetle can result in patch kill around the bole, top kill, and tree mortality. Top kill and tree mortality are often associated with trees already weakened by root disease, overstocking, drought, and heavy dwarf mistletoe infection (Keen 1952).

Western Pine Beetle

The western pine beetle *(Dendroctonus brevicomis)* is the most devastating insect affecting ponderosa pine in California and Oregon. Normally this beetle breeds in windfall, unhealthy trees, or in trees weakened by drought, stand stagnation, or fires, and beetle infestations usually lead to tree mortality (Keen 1952).

3.1.3.3 Noxious Weeds

No known noxious weed populations are within or immediately adjacent to the Project Area. The closest know noxious weed is yellow starthistle (*Centaurea solstitialis*) which is present along access roads approximately ¾ of a mile from the Project Area.

3.1.3.4 Current Stand Conditions

Approximately 90% of the stands proposed for treatment in the Project Area were naturally regenerated after the railroad logging that occurred in the early 1900s. Currently the stands are densely stocked as evidenced by declining radial growth, interlocked crowns, and self-thinning. In-growth of white fir has occurred as it is a species capable of establishing itself and growing under the canopy of other less shade tolerant conifers. As evidenced by cruise records from the 1920s, the original stands were dominated (as much as 60%) by ponderosa pine and sugar pine. Douglas-fir made up most of the remaining stocking. White fir now constitutes 30%–50% of these same areas today. The average tree DBH ranges from 6”–9”. The stocking in the Project Area is currently 500–1000 stems per acre while pre-European stocking was typically 150–350 stems per acre and averaged 12”–15” DBH for 90-year-old stands (Dunning and Reineke 1933). Fire suppression and the resulting lack of natural fire have led to the higher stocking rates observed today. White fir has established itself at much lower elevations than would have occurred had historic fire return intervals not been interrupted. Periodic low intensity wildfires would have killed the encroaching, shade tolerant white fir when they were in the seedling to sapling size classes while not damaging the pine and Douglas-fir overstory.

Many of the stands are experiencing density related mortality. Most of those trees are now on the ground and adding to the fuel load. Due to their small diameters, few trees remain standing more than four to six years after they die. A significant pulse of drought and insect-induced mortality occurred in the mid-1990s. Within a few years, this created many 0.1–0.5 acre pockets of dead and down, snapped off, or completely uprooted small diameter trees scattered throughout the Project Area. Even though mortality continues, the stocking levels are still abnormally high, dead fuel loading continues to increase, and the live crowns of many trees are still near the ground. This scenario provides conditions which favor the occurrence of large stand replacing fires. Dwarf mistletoe, particularly in Douglas-fir, is also quite prevalent. The current infection on an individual tree averages a DMR in the 2–3 range (Hawksworth 1977). A large tree component (those >36” DBH) is severely lacking in the Project Area and averages less than one tree per 5–10 acres. Hardwoods are also uncommon in the Project Area. Harvesting since the 1960s has resulted in the formation of 558 acres of conifer plantations which are currently in need of stocking control. Tree

crowns are touching and radial growth is declining in most of these plantations. Ponderosa pine and Douglas-fir are the dominant species. Live crowns extend nearly to the ground making even a low intensity summertime fire lethal to most of these trees.

Inventory plots were located in many of the stands to determine current stand attributes including the site class, canopy closure, BA, trees per acre, snag densities level of dwarf mistletoe infection, and stand density (summarized in Table 3-1).

The *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) grouped vegetation in the LSR into three main categories based on aspect and species composition. Mixed conifer stands were divided into two groups, the north and east facing slopes, and the south and west facing slopes. The other category identified was true fir which includes all slopes regardless of aspect. The interdisciplinary team further refined the breakdown of areas to include slope position (i.e., upper and lower halves of the slopes).

Mixed Conifer North and East Slopes

As displayed in Table 3-1, stands are heavily overstocked with over 800 small stems per acre. The average tree DBH is 6.8” and 92% of the trees are <12” DBH. Normal stocking would be in the 150–350 trees per acre range and average 12”–15” DBH for stands that are 90 years of age (Dunning and Reineke 1933). The SDI at 433 is well above the zone of imminent mortality. White fir is the primary species in many of the stands that were once primarily ponderosa, sugar pine, and Douglas-fir dominated as evidenced by cruise records from the 1920s. Due to suppression of fires, white fir also occurs much lower in elevation than would be found had natural fire intervals not been interrupted. Mortality has been occurring with a significant pulse in the mid-1990s and due to the small size of the dead trees, most are now on the ground.

Mixed Conifer South and West Slopes

These stands are 80 to 90 years of age and still fairly vigorous with good potential for development. Stands are overstocked at more than 900 trees per acre and average 6” DBH. The SDI averages 411, well above the density where mortality from inter-tree competition would begin. Ninety-three percent of the trees on these slopes are <12” DBH. The crowns of the trees are often interconnected and radial growth is declining. Although white fir encroachment is not as severe as on the north and east slopes it is now a significant component that historically was not there. See Table 3-1 for additional stand information.

True Fir Sites

At elevations above 5,200', the vegetation changes from mixed conifer to true fir. The sites are dominated by white fir lower in the zone to nearly pure stands of red fir along the crest.

The stands are very heavily stocked with over 500 stems per acre and averaging <9" DBH. SDI is at the level where mortality is beginning and in some stands, is already occurring. The vast majority (83%) of the trees are <12" DBH.

Defensible Fuel Profile Zones

The DFPZs follow main ridges from the upper reaches of the Project Area to creek bottoms, and encompass all aspects and slope positions. Therefore the current conditions for them are found within the descriptions of the stand types above.

3.1.4 Environmental Consequences

3.1.4.1 Alternative 1 – No Action

As stand densities increase, the effects of inter-tree competition will intensify. Density related mortality will have the greatest effect on the smaller trees in the lower canopy, but will also affect larger trees that are in a weakened condition. White fir, regardless of canopy position, is more likely to succumb particularly under drought conditions. As fewer trees occupy the available growing space there will be a gradual increase in the average stand diameter.

As trees continue to compete for resources they will remain susceptible to the diseases and insects that are present. The mistletoe infection will continue. As time passes infection intensity will increase and heavily infected trees will succumb. While stand level infections are currently low, the modeling suggests significant increases in the disease (DMR 2–4) with the passage of time, reducing growth rates by 10%–20%. With the passage of time fuel levels will continue to increase in all areas.

Table 3-1 displays relative trends for the No Action Alternative for various stand attributes. The three primary stand types are compared. The DFPZ is not listed as it is a subset of the other three types.

Table 3-1 Current and Projected Trends in Vegetation Attributes Under Alternative 1

Stand Attribute	North and East Slopes		South and West Slopes		True Fir	
	2006	2056	2006	2056	2006	2056
Average Diameter (in.)	6.8	12.2	6.0	11.9	8.9	11.2
Trees Per Acre	823	380	920	375	519	340
Basal Area (ft2/acre)	202	298	183	288	224	318
Stand Density Index	433	508	411	493	431	524
55% of max SDI	323	323	340	340	429	429
DMR	2.0	3.9	2.1	3.7	2.2	3.8
Canopy Closure	65%	66%	64%	66%	57%	62%
Snags/acre >16”	3.0	5.1	3.5	5.6	5.7	1.9
Trees/acre <12”	92%	72%	93%	76%	83%	78%
TPA >24”	9	31	9	31	10	34
TPA >30”	1	9	3	9	3	7

TPA=trees per acre, DMR = The average rating (on the 0 to 6 scale) of all the trees which have dwarf mistletoe for a given stand or, in our case, group of stands.

North and East Slopes Mixed Conifer

Currently over 90% of the trees in this category are <12” DBH. Stands are already in a condition that is not sustainable (>55% of SDI) and competition-induced mortality will continue to increase. Even after 50 more years, over 70% of the trees in the stand will still be <12” DBH. Individual tree architecture will also be altered when subjected to such dense conditions; the live crown will be reduced, limbs will be shorter and smaller in diameter, and needles will not be retained for as many years as the trees drop the foliage sooner due to competition for light and moisture. Approximately 54% of the trees will have died. Fuel loading will increase dramatically.

Disease conditions will accelerate. The average mistletoe rating will double. This indicates that an average infected Douglas-fir tree will be experiencing 15%–20% loss in both height and diameter growth (Hawksworth and Weins 1996). Those trees with even greater mistletoe infection, DMR 5–6, will be dying. Since the stands are overwhelmingly comprised of small diameter trees they will constitute most of the dead stems. Canopy cover will change little over time.

These stands will not meet Desired Conditions in a number of areas: the majority of the live and dead trees will be small (<12” DBH), SDI will remain above the zone of imminent mortality, average tree DBH per acre will be below 24” in 50 years, and square feet of BA will remain above the desired range of 120–150. This accompanied by the increasing on-the-ground fuel load will put the residual stems at much higher risk of stand-replacing wildfire. The large tree component will be less than desired. White fir, not a desired species, will dominate many of these stands.

South and West Slopes Mixed Conifer

At present more than 90% of the trees are <12” DBH for stands in this category. The stands are at densities that are above 55% of SDI where competition-induced mortality is occurring and will continue. On sites dominated by pine trees this overstocked condition puts the stands at additional risk from western pine beetle attack as the stands are already well above SDI levels of imminent beetle-induced mortality and getting worse each passing year (Oliver 1995). The loss of the existing pines would move these stands further from meeting the desired future condition. With another 50 years of tree growth three quarters of the stems would still be smaller than 12” DBH. The size and shape of trees will be affected by such heavily stocked conditions: crown reduction, reduced branch size, and needle retention. An estimated 60% of the trees will die during this 50-year period adding significantly to the current fuel loading.

The average dwarf mistletoe rating for this category would nearly double. Fifteen to twenty percent reductions in growth will occur and infected trees would be predisposed to other insects and diseases. Trees heavily laden with dwarf mistletoe will succumb. Few, if any, large snags will be created as the majority of the stand is comprised of small diameter stems and will be in 50 years. Canopy cover will remain at the same level.

These stands will not meet Desired Conditions as follows: the majority of the live and dead trees will be small (<12” DBH), SDI will remain above the zone of imminent mortality, average tree DBH per acre will be below 24” in 50 years, and square feet of BA will remain above the desired range of 120–150 per acre. This accompanied by the increasing on-the-ground fuel load will put the residual stems at much higher risk of stand replacing wildfire.

True Fir Zone

Current stand inventories show over 80% of the trees are <12” DBH. These stands are now at levels where competition-induced mortality is occurring. The modeling indicates SDI will remain above those levels for the projected period. At the end of this projection over three quarters of the stand will be made up of stems still <12” DBH. Trees in this category will also experience the effects from overstocking with shrinking crowns, reduced branch size, and needle retention. There will be a loss to mortality of 35% of the trees in the stand.

Dwarf mistletoe on the average infected tree would nearly double during this time projection for those in this zone. Infection levels will be about the same as in the other two categories so similar reductions in growth would be anticipated. Trees weakened by the mistletoe infection would be more susceptible to attacks by the fir engraver (Keene 1952). The canopy closure for these stands will increase slightly by about 5%.

These stands will not meet Desired Conditions as follows: the majority of the live and dead trees will be small (<12" DBH), SDI will remain above the zone of imminent mortality, average tree DBH per acre will be below 24" in 50 years, and square feet of BA will remain above the desired range of 150–200 per acre. This accompanied by the increasing on-the-ground fuel load will put the residual stems at much higher risk of stand replacing wildfire.

3.1.4.2 Alternatives 2, 4, 5, and the Preferred Alternative

The proposed treatment prescriptions for each of the vegetative categories are similar for all action alternatives. The primary differences between alternatives are yarding systems, the number of acres treated, and the fuels treatment method. This section focuses on the results of proposed silvicultural treatments. The Alternative 2 will be described for each vegetative group, followed by a discussion of the differences between alternatives including the Preferred Alternative.

Standard mitigation measures to prevent the introduction of weed sources, including equipment cleaning and weed-free seed and straw, have been incorporated into the Project Design Features. The Noxious Weed Risk Assessment determined that there is a low risk of introduction of noxious weed into the Project Area from sites outside the project (USDA Forest Service 2007d).

Reducing stand densities will lessen the amount of future mortality. It will provide large trees sooner than stands that are left untreated. Large trees, live or dead, are a structural component currently lacking in these stands due to past harvest. Cultivating large trees will provide large snags in the future. Table 3-2 displays the current condition of stands in the Project Area (prior to treatment modeled in 2006) and the results of implementing thinning prescriptions under Alternatives 2, 4, 5, and the Preferred Alternative immediately post-treatment and at 50 years (2056). Table 3-3 displays the difference in the number of acres treated by alternative and how well each alternative meets the purpose and need of habitat promotion and DFPZ development.

Table 3-2 Current Conditions in 2006, Post-Project Conditions, and 50-year Projection with Thinning Treatments Proposed for Alternatives 2, 4 and 5

Stand Attribute	North and East			South and West			True Fir		
	Current 2006	Post-Project	2056	Current 2006	Post-Project	2056	Current 2006	Post-Project	2056
TPA[1]	823	75	66	900	61	56	519	96	81
Average Diameter (Inches)	6.8	18.6	25.5	6.0	20.0	27.0	8.9	19.0	24.1
BA (ft^2/acre)	202	140	230	183	133	216	224	188	257
55% of Maximum SDI[2] (for comparison)	323	323	323	340	340	340	429	429	429

Stand Attribute	North and East			South and West			True Fir		
	Current 2006	Post-Project	2056	Current 2006	Post-Project	2056	Current 2006	Post-Project	2056
SDI	433	201	292	411	185	269	431	268	332
DMR[3]	2.0	1.9	2.8	2.1	2.0	2.7	2.2	1.8	2.9
Canopy Closure %[4]	65%	37%	51%	64%	37%	50%	57%	41%	47%
Snags >16”	3.6	3.6	.9	3.5	3.5	.7	7.0	7.0	1.9
TPA >24”	9	9	36	9	9	41	10	10	35
TPA>30”	1	1	14	3	3	15	3	3	14

1TPA=trees per acre

2SDI=stand density index

3DMR=the average rating (on the 0 to 6 scale) of all the trees which have dwarf mistletoe for a given stand or, in our case, group of stands.

4Canopy cover estimates are FVS model predictions based on a uniform treatment across stands. This estimate does not incorporate the untreated portion of stands (i.e., the >15% of each stand untreated in the variable density thinning prescription, habitat retention areas, etc.). Thus, the FVS model underestimates average canopy cover post-treatment.

Table 3-3 Number of Acres Treated by Alternative

Effect or Output	Alternative 1 No Action	Alternative 2	Alternative 4	Alternative 5	Preferred Alternative
Acres of habitat thinned to promote growth and restore late-successional forest (early and mid-successional forest)	0	2,997	2,487	2,987	2,951
Percent of early and mid-successional habitat acres treated to reach desired amount of late-successional/old-growth habitat in the Project Area	0%	81%	66%	81%	80%
Acres of treatment to develop a DFPZ and reduce wildfire threat	0	1,286	1,275	1,202	1,058

North and East Slope Mixed Conifer Stands

The proposed treatment for stands in this category emphasizes reduction of present stocking levels (density reduction) to enhance development of late successional structural components. Included in this treatment is biomass reduction to improve current and future stand resiliency to wildfire. Thinning of both commercial and pre-commercial sized conifers at variable densities would occur.

On the lower portions of the slopes higher canopy closures will be retained with a general decrease in canopy closure as the ridge tops are approached. Trees up to 20” will be removed with the majority being the smallest trees in the stands. The treatments will favor Douglas-fir and hardwoods

for retention. Removal of white fir will be emphasized at lower elevations <4500'. Individual large trees would be cultured by removing most of the surrounding trees that are competing for moisture and sunlight. Approximately 15% of the area in stands on the lower slopes will remain untreated for diversity. Areas containing late-successional attributes (large trees, snags, heavy mistletoe infections, on-the-ground large logs) will be selected for retention. The stands that are further upslope, including DFPZs along selected ridgelines, would be thinned more heavily, mimicking historical conditions on ridges (*KNF Forest-wide Late Successional Reserve Assessment* [USDA Forest Service 1999] and *KNF Beaver Creek Ecosystem Analysis* [USDA Forest Service 1996b]).

The effects of thinning immediately post-project include a significant reduction in trees per acre and a doubling of average stand diameter due to removal of small trees. BA is within the desired range of 120–150 ft^2 per acre and SDI is below the zone of mortality. Modeled canopy closure is below the desired range, however, as discussed in Analysis Methods, the model does not account for untreated patches and under-estimates canopy closure. Average canopy closure is expected to be between 40 and 60% post-treatment.

Fifty years after treatment the average tree diameter would be twice as large had the stand been left untreated. Based on the modeling predictions for the next 50 years, there would be 15% more trees >24" DBH and 11% more trees >30" DBH than if left untreated. BA is higher than post-project and is almost within the range desired for stands 150 years old (245–283 ft^2 per acre). SDI would remain at densities below the point where inter-tree competition-induced mortality is anticipated. Canopy closure is within the desired range, averaging 51%. The resultant stands would be one dwarf mistletoe rating class lower. Seventy percent of the trees in the treated stand would be larger than 24" DBH, while only 8% would be in those larger diameter classes if left untreated. At fifty years, the stands will contain a well developed overstory with the majority of the overstory trees >24" DBH.

South and West Slope Mixed Conifer Stands

The proposed treatment for stands in this category emphasizes reduction of present stocking levels (density reduction) to enhance development of late successional structural components. Included in this treatment is biomass reduction to improve current and future stand resiliency to wildfire. Thinning of both commercial and pre-commercial sized conifers at variable densities would occur.

On the lower portions of the slopes higher canopy closures would be retained with a general decrease in canopy closure as the ridge tops are approached. In comparison to the north and east slope category canopy closure will be 10%–20% lower for the same slope position. A thinning from below will remove trees up to 20" DBH. The treatments will favor sugar pine and hardwoods for retention. White fir would be the least desirable species to retain particularly below 4,500'.

Individual large trees will be cultured by removing most of the surrounding trees that are competing for moisture and sunlight. Approximately 15% of the area in stands on the lower slopes will remain untreated. Areas containing late-successional attributes (large trees, snags, heavy mistletoe infections, large downed logs) will be selected for retention. The stands that are further upslope, including DFPZs on ridgelines, will be thinned more heavily.

The effects of thinning post-project include a significant reduction in trees per acre and an average stand diameter more than three times greater than without treatment due to removal of small trees. BA is within the desired range of 120–150 ft^2 per acre and SDI is below the zone of mortality. Modeled canopy closure is below the desired range, however, as discussed in Analysis Methods, the model does not account for untreated patches and under-estimates canopy closure. Average canopy closure is expected to be between 40 and 60% post-treatment.

Projections out 50 years indicate a 25% increase in trees >24" than if left untreated, and a 15% increase in the number of trees >30" DBH. Reduced stocking densities would preclude inter-tree competition-induced mortality. BA is higher than post-project and is within the range desired for stands 150 years old (210–245 ft^2 per acre). SDI would remain at densities below the point where inter-tree competition-induced mortality is anticipated. Canopy closure is within the desired range, averaging 50%. By treating the stand, there would be reduction of one full DMR class. Treating these stands will result in 68% of the trees being >24" compared to 8% in the untreated.

True Fir Stands

The proposed treatment for the stands in this category is very similar to the previous two sections. To enhance certain desired structural components of late-successional stands, current stocking levels (density) would be reduced. Biomass reduction for wildfire resiliency would be included in the treatment. Thinning of both commercial and pre-commercial-sized conifers would occur.

Higher canopy closure is desired, similar to north and east lower slopes, regardless of slope position or elevation. A thinning from below would remove trees up to 20" with most being the smallest in the stands. Sugar pine and Douglas-fir would be the species of preference for retention where they currently occur. During thinning, removal of trees may result in occasional "gaps" which will be created in stands to encourage the development of large individual trees and to maintain special habitats (e.g., individual or patches of hardwoods, meadows or wet areas). Theses gaps would represent about 15% of the stand treated and range in size between 0.25 and 0.5 acre. Forest cover would be maintained in these gaps through the use of leave trees. A variety of stand conditions would exist but all would include a conifer or hardwood component. The density of overstory trees would however be significantly lower than the surrounding stand condition.

The effects of thinning immediately post-project include a significant reduction in trees per acre and an average stand diameter twice as large as stands without treatment. BA is within the desired range of 150–200 ft^2 per acre and SDI is below the zone of mortality. Modeled canopy closure is below the desired range, however, as discussed in Analysis Methods, the model does not account for untreated patches and under-estimates canopy closure. Average canopy closure is expected to be above 60% post-treatment.

Model results at 50 years indicate a small increase in trees >24" than if left untreated, and a 17% increase in the number of trees >30" DBH. BA is higher than post-project and is within the range desired for stands 150 years old (210–300 ft^2 per acre). SDI would remain at densities below the point where inter-tree competition-induced mortality is anticipated. Canopy closure is modeled below the desired range, averaging 47%, however average canopy closure is expected to be over 60%. By treating the stand, there would be reduction of one full dwarf mistletoe rating class.

3.2 Wildlife and Habitat

This section covers wildlife and habitat potentially affected by the project. Section 3.2.1 discusses analysis methods. Section 3.2.2 addresses the significant issue of temporary spur road construction effects on habitat. Habitat is further covered in sections 3.2.3–3.2.5. Individual species are discussed in Section 3.2.6–3.2.19.

The purpose of the project is to promote the development of late-successional forest and protect existing late-successional habitats. The effects of each alternative on NWFP LSRs, Endangered and Threatened species protected under the ESA; designated Critical Habitat for those species; species listed as Sensitive by Region 5 of the USDA Forest Service, NWFP Survey and Manage Species, Management Indicator Species designated in the LRMP, big game, and the avian communities within the Project Area are identified below. Among the most notable of these are NSO which are protected through multi-state habitat management plans. How well each alternative would meet the project objectives and the impacts to wildlife and their habitats are discussed within this section.

3.2.1 Analysis Methods

Wildlife and their habitats were analyzed using GIS and the FVS model (as described in Section 3.1). The affected environment for each species is described in terms of the amount and type of habitat present on the KNF, and effects are estimated in terms of habitat amount and/or quality following the proposed project (largely based on FVS results). Section 3.2.1.1 covers analysis

methods for the temporary road construction issue specifically, and Section 3.2.1.2 discusses more general wildlife and habitat analyses.

3.2.1.1 Temporary Spur Road Construction Analysis

Analysis of habitats that may be affected by proposed temporary spur road construction were based on forest stages and were limited to late-successional forest, mid-successional forest, and riparian areas because these are the habitats proposed for treatments, and/or are the habitats used by Threatened, Endangered, Sensitive, and Survey and Manage species. Acres of habitat were calculated using ArcInfo and the Forest database layers for: Successional Stages, roads, and Proposed project activities. The late-successional forest polygons that were intersected by proposed spur roads were verified and updated as necessary by USFWS wildlife biologist, Dave Johnson, based on aerial photograph interpretation, map interpretation, and field review in 2005 and 2006. Proposed road alignments and associated forest types were field verified by Dave Johnson and road engineers in 2006. Acres of riparian or mid-successional forest habitat affected by road construction were calculated by assuming that temporary roads will be 12' wide (running surface) and will affect an area up to 26' wide by the removal of trees to clear space for the road (Davis pers. comm.). Acres of late-successional forest removed or degraded was calculated using aerial photograph interpretation, Successional Stages map, a dot grid, and by assuming a 30 foot wide affected area to account for larger tree canopy (shading) potentially being removed.

Road Density was calculated using ArcInfo and the Roads layer in the Forest database. Total-road density calculations (refer to Table 3-4) include all roads: open, closed and unauthorized, averaged per square mile within each 7th-field subwatershed. Open-road density estimates (refer to Table 3-4) are from the *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b) and include only those roads open to vehicular traffic.

Most road density discussions in the literature relating to effects on wildlife focus on open-road density. Most of the documented changes in animal behavior, such as changes in movement, reproductive success, escape response and physiological state, are related to use of open roads by humans and vehicles (J. Thomas 1979; Trombulak and Frissell 2000; Wydeven et al. 2001; Rowland et al. 2005). The proposed temporary spurs roads will not be open to general vehicular traffic during project implementation and will be decommissioned post-project; there will be no increase in open-road density. Therefore, open-road density thresholds often used to evaluate wildlife habitat capability (USDA Forest Service 1995a, app. I), that incorporate human disturbance as a factor, have limited utility as indicators for the effects of temporary spur road construction. However, for lack of a better measurable indicator for disturbance, both open-road density and total-road density will be used to compare the effects of road related disturbance as well as an indicator of habitat

fragmentation; increase in total-road density (linear openings) equates to an increase in forest habitat fragmentation.

3.2.1.2 LSRs, Wildlife, and Habitat Analyses

The analysis area for wildlife, with the exception of the NSO and Pacific fisher, is synonymous with the Project Area as displayed on Map 4, and includes the Beaver-Grouse and Long John sub-watersheds and portions of the Upper Cow, Deer-Beaver, and Headwaters of Cottonwood Creek sub-watersheds. The analysis area for the NSO includes the Project Area as well as the 1.3 mile estimated home ranges of NSOs that overlap with the Project Area. Thus, the NSO analysis area is approximately twice the size of the Project Area. The analysis area for Pacific fisher includes the Project Area plus a 1.5–2 mile buffer around the Project Area and the north zone of the Mt. Ashland LSR.

All of the stands identified for thinning and/or fuels treatment received an on-site review by a certified silviculturist and a wildlife biologist. Each stand was evaluated for its function as NSO and/or other late-successional associated species habitat and other unique structural components of these stands (i.e., talus or rocky outcrops, snag patches, hardwoods, etc.) were recorded. Field data (size class, BA, trees per acre, snag densities, stand density, canopy closure, etc.) were also collected from a representative sample of stands in each of three categories: north and east slopes mixed conifer, south and west slopes mixed conifer, and true fir. Site-specific prescriptions were developed based on information collected during field review.

Analysis focused on how the proposed alternatives would affect LSRs, critical habitat objectives, and habitat requirements of the wildlife species in the Project Area. Effects were evaluated by examining:

- Changes in abundance and/or distribution of
    - Large diameter trees,
    - Snags,
    - DWD, and
    - Structural abnormalities such as mistletoe brooms;
- Reductions in
    - BA,
    - Canopy cover,
    - Habitat connectivity;
- Disturbance of stand microclimates including talus or rocky substrates, and riparian habitat;
- Changes in any habitat removed (acres);
- Changes in anticipated fire behavior.

To evaluate the efficacy of the alternatives to develop late-successional habitat over time, stand development was modeled for a 50-year period. The specific habitat variables used for that evaluation included large trees, snags, and DWD, stand density, and BA.

The Project Wildlife and Habitat Report and the Project Wildlife BA/BE provide further background and detailed information that supports the discussions in the Wildlife and Habitat section. These documents are incorporated by reference and available in the project file.

3.2.2 Significant Issue: Temporary Spur Road Construction Effects on Habitat

Temporary spur road construction may increase road density, result in habitat fragmentation, increase edge habitat, and result in harassment to wildlife. The key indicators used to analyze this issue were:

- Acres of forest habitat removed; and
- Change in miles per square mile of roads (road density).

Proposed temporary spur road construction can affect wildlife species through habitat fragmentation, increased edge habitat, and potential harassment by humans. Fragmentation occurs when large blocks of habitat (e.g., forest) are broken into smaller patches by roads or openings. Forest-edge habitat is the boundary between two habitats, such as between late-successional forest and early successional forest (or an opening). Increased forest-edge habitat results in a decrease in interior forest, including changes in microclimate (increased sun and wind), and potential vulnerability to external competition and predation. Change in fragmentation and increased edge habitat can be measured by acres of habitat removed and total-road density. Harassment occurs from human disturbance, including vehicular traffic, use of machinery, logging operations, and recreational activities like hunting. Human harassment can be measured by miles per square mile of road density, which is an indicator of how much use an area gets from humans and vehicular traffic.

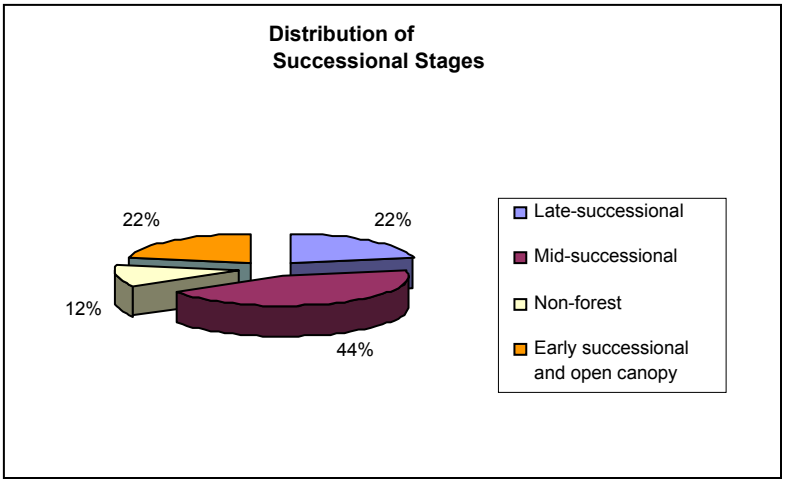

Figure 3-4 Distribution of Successional Stages

3.2.2.1 Affected Environment

Forested habitat in the south zone of the Mt. Ashland LSR, especially within the Project Area, has been fragmented by past timber harvest and road building as described in the

previous section (refer to the Vegetation Section 3.1). Successional stage distribution within the south zone is displayed in Figure 3-4.

Mid-successional forest is the dominant forest type; it is fragmented by past harvest, roads and, at higher elevations, natural openings. Late-successional forest, as represented in Figure 3-4, occurs mostly outside of the Project Area (in the Cow Creek drainage) or in patches low in draws (refer to Map 3 in Appendix A).

Current road density in the Project Area is displayed below as both open-road density (roads open to vehicle travel) and total-road density (including closed and unauthorized roads) by 7th-field subwatershed (Table 3-4).

Table 3-4 Change in Open Road Density* and Total Road Density* by Subwatershed for the Preferred Alternative

Subwatershed	Pre-project Open Road Density (miles/sq. mile)	During Project Open Road Density (miles/sq. mile)	Post-project Open Road Density (miles/sq. mile)
Upper Cow Creek	3.00	3.00	3.00
Deer-Beaver	4.40	4.40	4.40
Long John Creek	3.90	3.90	3.00
Beaver-Grouse	3.50	3.50	3.37
Headwaters Cottonwood	Not Available	Not Available	No change
Subwatershed	**Pre-project Total Road Density**	**During Project Total Road Density**	**Post-project Total Road Density**
Upper Cow Creek	3.70	3.73	3.67
Deer-Beaver	5.58	5.60	5.47
Long John Creek	4.92	5.02	4.26
Beaver-Grouse	4.50	4.52	4.33
Headwaters Cottonwood	3.01	3.01	3.01

*Open-road density includes roads open to vehicular traffic. Total-road density includes all roads: open, closed, or unauthorized.

Road density in the area is high. Based on Habitat Capability Models in the LRMP (USDA Forest Service 1995a, app. I), open-road densities between 1 and 3 miles per square mile reduce habitat capability to moderate (moderate road density) and open-road densities greater than 3 or 4 miles per square mile reduce habitat capability to low (high road density) for deer, elk, marten and fisher. Although these models factor in general human disturbance and vehicular traffic associated with open roads, which does not apply to this project, these thresholds can still be used to indicate what is meant by “moderate” or “high” road density.

The number of temporary spur roads to be constructed and their total miles varies by action alternative (22 temporary roads totaling 6.86 miles under Alternative 2, 16 temporary roads totaling 4.96 miles under Alternative 4, nine temporary roads totaling 2.27 miles under Alternative 5, and 8 temporary roads totaling 1.7 miles under the Preferred Alternative). Temporary roads range in length

from 0.06 to 0.86 miles under Alternatives 2 and 4, 0.06 to 0.43 miles under Alternative 5, and 0.06 to 0.47 miles under the Preferred Alternative. Temporary road construction is proposed in a variety of forest successional stages within five subwatersheds. Table 3-5 displays the proposed temporary spur roads in the Preferred Alternative by forest stage and subwatershed. Under Alternatives 2 and 4, approximately 300 feet of temporary road T401 would be constructed parallel to a stream within a Riparian Reserve.

Table 3-5 Acres of Forest Habitat Affected by Temporary Road Construction/Number of Roads for the Preferred Alternative.

Forest Stage	7th-Field Subwatershed				
	Upper Cow	Deer-Beaver	Long John	Beaver-Grouse	Upper Cottonwood
Late-Successional	0	0	0.5 acres 2 roads	0	0
Mid-Successional Dense	0.7 acres 1 road	0	1.6 acres 2 roads	0	0
Mid-Successional Open	0	0	1.2 acres 1 road	0	0
Early Successional	.6 acres 1 road	0.4 acres 1 road	0.5 acres 1 road	1 acre 2 roads	0
Non-forest	0	0	0	0	0

3.2.2.2 Environmental Consequences

Effects of Alternative 1 – No Action

Under the No Action Alternative, no temporary road construction, road closures or road decommissioning will occur. There will be no loss of forested habitat; the fragmentation of the landscape and the amount of forest-edge habitat will not be affected. Access by vehicles and humans will remain the same. Open-road density and total-road density will remain high, as displayed in Table 3-4 under pre-project open (or total) road density.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

Habitat Fragmentation, Increased Edge Habitat, and Harassment

To meet project objectives and LRMP guidelines (USDA Forest Service 1995a, MA5-22), temporary spur road construction will be kept to a minimum and will be routed to avoid late-successional habitat and large trees to the extent possible. As such, approximately 0.5 to 1 acre of late-successional forest will be degraded on two temporary spur roads (T320B and T216) with implementation of the Action Alternatives (degrade refers to forested stands in which some late-successional qualities may be removed but as a whole the stand would still retain late-successional

character and function). The approximate mid-successional forest that would be removed includes 9 to 12 acres under Alternatives 2, 4, and 5, and 3.5 acres under the Preferred Alternative. The remainder of the area affected (10.5 acres under Alternative 2, 8.5 acres under Alternative 4, 8 acres under Alternative 5, and 2.5 acres under the Preferred Alternative) is either early successional forest or non-forest habitat.

Late-successional stands proposed for entry differ by alternative but include one open-canopy, ridge top stand of approximately 35 acres and two closed canopy mixed conifer stands ranging in size from 0.25 acre to 5 acres. These patches are surrounded by mid- and early-successional forest that has been logged in the past. Species present in the area are most likely those adapted to more open forest or forest-edge habitat. Because temporary spur road construction would impact late-successional stands that are either already open or small, the fragmentation and increases in habitat edge of late-successional stands is expected to be insignificant at the landscape and project scale.

The short-term effects of constructing and using the temporary spur roads associated with late-successional forest includes potential injury or death of slow-moving species such as mollusks, amphibians, rodents, or ground nesting species. Effects to species of concern such as Survey and Manage salamanders and mollusks are presented in discussions on individual species. It is expected that larger and more mobile animals (birds, fisher, deer, and elk) will move away from disturbance associated with construction and use of the road, resulting in short-term avoidance behavior. Narrow, linear disruptions in the forest vegetation are not expected to pose barriers to mobile species but may create partial barriers to movements of less mobile species. Because all temporary spur roads will be decommissioned post-project, potential barriers to animal movement are expected to be short-term until vegetation becomes reestablished. In the long-term (more than 20 years), the project will result in beneficial effects to late-successional forest since unauthorized road 40S14.2 will also be decommissioned post-project.

Removal of between 3.5 to 12 acres of mid-successional forest in small patches scattered over 4 to 14 different spur roads will have minor effects on forest habitat. Narrow linear patches ranging in size from 0.2 to 2.5 acres will occur in a landscape that is already highly variable (a mix of successional stages). Short-term effects of construction and use of roads may result in direct disturbance, injury or death of slow moving organisms and/or avoidance behavior by more mobile species. Avoidance behavior will likely continue during project activities and will discontinue after roads have been decommissioned and reclaimed by native vegetation. Long-term effects of constructing and decommissioning temporary spur roads will be neutral because temporary roads will have been reclaimed by native vegetation and trees, thereby minimizing openings or breaks in the habitat, and linear alignments will likely be shaded by the growth of trees in adjacent thinned stands. Long-term effects of the proposed project on road-related fragmentation or forest-edge will be beneficial in that unauthorized roads and part of road 40S20 will be decommissioned. As

decommissioned roads recover and are reclaimed by native vegetation, fragmentation and edge will decrease.

Approximately 0.16 acres of riparian habitat may be impacted from Alternatives 2 and 4 where a portion of T401 enters a Riparian Reserve. Short-term effects include loss of riparian vegetation and potential injury or death of slow-moving or riparian associated species (frogs, turtles, salamanders, rodents). Temporary spur road T401 will be decommissioned after the project is completed, therefore, negative effects will diminish as riparian vegetation reclaims the area (generally one season for herbaceous vegetation). Effects of temporary spur road construction on Riparian Reserve indicators for aquatic habitats are discussed in the Biological Assessment for Fish; in summary the proposed road actions, including construction of temporary spur roads and decommissioning/closing of roads, will have insignificant negative effects in the short term and beneficial effects in the long-term to aquatic habitats.

Refer to the next section – Wildlife and Habitat – for a species specific discussion of temporary spur road construction effects on species of concern, including: Threatened, Endangered, Sensitive, Survey and Manage, Management Indicator Species, and species of interest such as deer and elk.

Road Density and Harassment

The Action Alternatives propose construction of between 1.7 (the Preferred Alternative) and 6.86 (Alternative 2) miles of temporary spur road. Under all of the alternatives, the majority of temporary spur road construction would occur within the Long John and Beaver-Grouse 7th field subwatersheds. Construction of spur roads would result in a short-term increase in total-road density during the time the project occurs (1–2 years in any given location, refer to Table 3-4). The majority of the proposed temporary spur roads would occur in plantations, early-, and mid-successional forest stands. Thus, only 0.12 (Preferred Alternative) to 0.25 (Alternative 2) miles of temporary spur road is proposed in late-successional forest.

The short-term increase in total-road density, during implementation of the project, would result in direct disturbance effects to wildlife (harassment). Disturbance associated with temporary spur roads will be limited to the construction of the road itself and the use of the road to conduct thinning and fuels treatments. Indirect disturbance effects of road construction would result from use of roads by humans and vehicles later in time—that is, if the roads were open to the public. However, all temporary roads will be decommissioned; therefore there will be no indirect effect from open roads and no increase in open-road density.

Long-term, the project will have beneficial effects in the form of reduced open-road and total-road density as displayed in Table 3-4. All temporary spur roads will be decommissioned after project implementation and road surfaces will be prepared for revegetation (planting with native species

and/or natural seed establishment). In addition, under all Alternatives, 0.5 miles of road 40S20 will be decommissioned, 9.3 miles of open roads will be closed, and 8 miles of unauthorized roads will be hydrologically stabilized and closed. Vehicular traffic in the Project Area will be reduced and potential harassment of wildlife, associated with road access, will be reduced. With a reduction in total-road density, the early- and mid-successional stands adjacent to closed and decommissioned roads will mature over time. As the overstory canopy in these stands becomes dominated by larger diameter trees, canopy cover over the roads will likely increase. Once the decommissioned roads become revegetated and the early- and mid-successional stands begin to mature, fragmented and edge habitats will begin to be obscured. Thus, the minor effects of habitat fragmentation and increased edge habitat from temporary spur road construction are expected to be short-term.

Summary

Construction of temporary spur roads will have minor impacts on forest habitat in general and will have an insignificant effect on late-successional forest in particular. Effects of road construction will vary by species. For example, there is little evidence to suggest that highly mobile species such as the NSO and Pacific fisher would be significantly impacted by the level of habitat fragmentation typically associated with logging road construction. Conversely, logging roads can create partial barriers to movements for species that have limited dispersal capabilities such as salamanders and mollusks. However, because the increase in forest fragmentation and edge habitat is minor, and barriers to movement would be short-term, the construction of temporary spur roads is not expected to significantly impact these species. The negative effects of temporary road construction in the project will be exceeded by the benefits of habitat restoration thinning and fuels reduction.

Most studies of road effects on wildlife focus on impacts from vehicular traffic and associated human disturbance or harassment to wildlife. Short-term harassment may occur during road construction and thinning treatments. All temporary roads will be decommissioned post-project; therefore, there will be no long-term increase in road related disturbance. Unauthorized roads and a portion of road 40S20 will also be decommissioned, therefore, over the long-term, the project will have beneficial effects through a reduction in road density.

3.2.3 Late-successional Reserves

The entire project is within the boundary of the Mt. Ashland LSR. LSRs are land allocations established in the NWFP (USDA Forest Service and USDI Bureau of Land Management 1994a). LSRs in combination with other land allocations and associated Standards and Guidelines, were established to maintain a functional, interactive, late-successional and old-growth forest ecosystem. They were designed to serve as habitat for late-successional and old-growth related species including the NSO. Specific to NSOs, LSRs primary function are to support population clusters.

3.2.3.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.3.2 Desired Condition

The Project Area is located within a NWFP LSR and designated NSO critical habitat. As such, stands in the Project Area should provide habitat for late-successional associated species including the NSO. Desired structural components in LSRs include (1) multispecies and multilayered assemblages of trees, (2) moderate-to-high accumulations of large logs and snags, (3) moderate-to-high canopy closure, and (4) moderate-to-high number of trees with structural imperfections such as cavities, broken tops, and large deformed limbs. Because not all forested stands within LSRs are late-successional, the NWFP recognizes the role of silviculture in providing and maintaining these components. Thus stands in the Project Area should provide the following habitat components:

- Large trees > 24”
- Large snags: 4–5 per acre in the 15”–25” DBH range and 2–3 per acre >25” DBH in mixed conifer and true fir stands, and 1–2 per acre in the 15”–25” DBH range and 1–2 per acre in >25” DBH in pine and dry Douglas-fir sites
- Large DWD: 10–13 tons per acre >20” DBH and 5–7 tons >9” DBH in mixed conifer and true fir, and 1–2 tons per acre >20” DBH and 1–2 tons per acre >9” DBH in pine and dry Douglas-fir sites
- BA in mixed conifer stands between 160 and 300 ft^2/acre
- Average canopy closure > 60 % on north and east facing slopes and > 40 % on south and west facing slopes and ridge tops
- Vertical diversity, multi layers
- Horizontal diversity, variable density
- Presence of mistletoe or other structural abnormalities.

Stands exhibiting these characteristics also should be widely distributed across the Project Area.

3.2.3.3 Affected Environment

Currently, only 10% of the Project Area contains late-successional forest. Most of the remnant late-successional stands occur in small patches (typically between 1 and 25 acres) and are not widely distributed. Much of the intervening forest is composed of plantations and early- and mid-successional stands that have regenerated following the railroad logging era. Many of these stands exhibit high density (500–900 trees per acre), small average DBH (6”–9”), and little understory development. While legacy late-successional components from the original stand occasionally exist in these regenerated stands, large-diameter trees, snags, and DWD are generally lacking. Thus, these stands typically lack structural diversity and provide little habitat for late-successional associated species. Currently, only 30% of the Mt. Ashland LSR contains late-successional forest. This is approximately 50% below the desired amount of late-successional forest for this LSR (USDA Forest Service 1996a; USDA Forest Service 1999). Because many of the early- and mid-successional stands within the project are young and healthy, they are expected to respond favorably to silvicultural treatments that reduce stand density.

Patterns of fire severity play an important role in determining stand and landscape diversity (Skinner et al. 2006). Historically, the general fire regime within the Klamath Mountains Bioregion (northwestern California and southwestern Oregon) was frequent, low- to moderate-intensity fire (ibid.). Under this regime, stands were generally open and the landscape was characterized by a mosaic of successional stages and a high degree of spatial complexity due to the creation of openings of variable size within the forest matrix (Taylor and Skinner 1998; Taylor and Skinner 2003). This suggests that dense, homogenous stands of late-successional forest were historically distributed in a complex mosaic across the landscape. As fire occurrence in the Klamath Mountains has declined (Skinner et al. 2006) changes in landscape patterns have become evident. Today forests are generally denser, have a greater concentration of fuels, have a higher incidence of shade-tolerant species, and are less spatially complex; the size and total acres of forest openings is declining (Skinner 1995; Taylor and Skinner 2003; Skinner et al. 2006). Effects of recent high-severity burns appear to be different than historic patterns with more area burning at high intensity (Skinner et al. 2006). This pattern suggests that late-successional habitat is less sustainable currently than it was historically. To some degree proposed treatments are expected to mimic natural disturbance by reducing stand density and existing fuel loads. Thus, proposed treatments are expected to increase the sustainability of late-successional habitat in the Project Area by changing stand structure to more closely resemble historic conditions.

Prior to timber harvest activities throughout much of the 1900s, much of the Beaver Creek watershed, which includes the Project Area, was late-successional mixed-conifer forest (USDA Forest Service 1996b). This suggests that late-successional stands were well-distributed, even though late-successional forest in the Project Area is naturally fragmented due to its historic fire regime,

predominately south facing orientation, and naturally occurring openings at higher elevations. Currently, only 1,200 acres (10%) of the Project Area contain late-successional stands. Throughout most of the Project Area, remnant late-successional stands occur in small patches (typically between 1 to 25 acres) and are not widely distributed. Much of the intervening forest is composed of plantations and early- and mid-successional stands exhibiting high density and canopy closure. Larger, more contiguous patches of late-successional forest exist in the higher elevation portions of the mixed conifer zone and true fir zones but are limited to the northeast corner of the Project Area. Thus, the amount and distribution of late-successional stands are considerably reduced in the Project Area relative to its historic condition.

3.2.3.4 Environmental Consequences

Effects of Alternative 1 – No Action

Under the No Action Alternative late-successional habitat would be slow in developing and the potential fire behavior in the Project Area would remain unacceptable relative to LSR objectives. FVS modeling indicates that 50 years from present stands will still be dense, averaging >340 trees and 285 ft^2 BA/acre, and dominated by trees <12.5" DBH. An average of seven to nine trees per acre >30" would be expected. Due to the limited large tree component, recruitment of large diameter snags and DWD is expected to be low. Density-related mortality is expected to continue, with 35%–60% of the extant trees dying within that period. Thus, surface fuels are expected to dramatically increase over time. Additionally, in the event of a fire start, the Fire Fuels Extension (FFE) of the FVS model indicates several general patterns regarding fire behavior and fire-induced tree mortality over time including (1) a constant or increasing crown fire potential under both moderate and severe weather conditions, (2) an increase in surface fire intensity under both moderate and severe weather conditions, and (3) either a constantly high or increasing level of BA mortality. Thus, the No Action Alternative increases the potential for fire to remove the desired structural components of an LSR and does little to promote and maintain a functional, interactive, late-successional and old-growth forest ecosystem.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning designed to promote the development of late-successional habitat will not remove important structural components of LSRs such as large-diameter trees (>20"), snags, and DWD.

Trees infected with mistletoe may be removed, but silvicultural prescriptions have been designed to ensure that this structural component will remain on the landscape. Thinning to create DFPZs and fuels treatments may remove large-diameter trees, snags, and DWD. However, the removal of large-diameter trees in DFPZs would only occur under limited circumstances (see Section 3.3 Fire and Fuels). Additionally, the incorporation of the *Mt. Ashland Late-successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and DWD where stand conditions permit, and by limiting the felling of snags > 20" or groups of snags to situations where they pose a hazard to operations, will ensure that these components will be retained. Therefore, only 4 acres of late-successional habitat is expected to be degraded in DFPZs under Alternatives 2 and 4, and none would be degraded under Alternative 5 and the Preferred Alternative.

Construction of temporary roads has the potential to remove large-diameter trees, snags, and DWD, and fragment existing late-successional stands. To the extent possible, temporary spurs have been routed to minimize impacts to large-diameter trees and late-successional stands. Approximately 0.12 (Preferred Alternative) to 0.25 (Alternative 2) miles of temporary spur road is proposed through existing late-successional stands. Thus, approximately 0.5 to 1 acre of late-successional forest, or <0.1% of extant late-successional forest in the Project Area will be degraded. A sample inventory of stands within the Project Area indicated that DWD > 24" is limited (Laurent pers. comm.). Therefore, because large DWD is an important structural component of LSRs, all trees >24" that need to be felled for temporary roads will be left on site.

Under Alternatives 2, 4, and the Preferred Alternative, one landing is proposed in a mature mixed conifer stand resulting in the removal of approximately 0.5 acre of late-successional habitat.

Because only 1 to 5.5 acres of late-successional forest would be removed or degraded (0.4 % of extant late-successional forest in the Project Area) in small, isolated segments the action alternatives are not expected to impact the ability of the Mt Ashland LSR to provide its intra- and inter-provincial connectivity roles and to provide a functional, interactive, late-successional and old-growth forest ecosystem.

Indirect Effects

Over time, thinning and fuel reduction treatments are expected to enhance the connectivity and late-successional and old-growth ecosystem function of the LSR by increasing the amount, distribution, and diversity of late-successional habitat and by reducing fuels to a level that would result in an acceptable fire behavior and post-fire stand condition. FVS modeling indicates that 50 years post-thinning stands will be less dense (averaging between 56 and 81 trees/acre) and will increase in BA. Average tree diameter would increase to between 24" and 27" and 14 to 15 trees per acre >30" would be expected. An increase in the amount of large-diameter trees also improves the recruitment of large snags and DWD. FFE modeling indicates that thinning and subsequent fuels treatment will

generally reduce crown fire potential or maintain a surface fire type and significantly reduce predicted stand mortality in the event of a fire start. These factors indicate that stands will be more resistant to large-scale fires but will burn with sufficient intensity to create small openings within forested habitat.

Cumulative Effects

According to the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a), 30% (14,980 acres) of the LSR contained late-successional stands in 1996. The majority of these existing stands occurred in the northern portion of the LSR (8,370 acres), where it was distributed in large contiguous blocks. In the southern portion of the LSR, late-successional stands were less abundant (6,610 acres) and were typically found in draws resulting in smaller more linear blocks. Since 1996 there has been no measurable loss of late-successional forest in the LSR. Reasonably foreseeable actions in the northern portion of the LSR include the Ashland Watershed Protection Project and the Ashland Forest Resiliency Project. Late-successional habitat for the Ashland Watershed Protection Project and the Ashland Forest Resiliency Project is defined in the Ashland Forest Resiliency DEIS (USDA Forest Service 2005a) as, "…late successional forest stages as well as other interrelated elements of an ecosystem resulting in habitat where dependent species are capable of surviving." It is important to note that this differs from the definition of late-successional stands or forest (stands with average tree diameter >24") as defined in the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) and referred to during the analysis of project effects, resulting in different baseline estimates. Using the AFR definition of late-successional habitat, the Ashland Forest Resiliency DEIS estimates that approximately 28,800 acres of late-successional habitat currently exist in the Mt. Ashland LSR. Based on data reported in the Ashland Forest Resiliency DEIS, approximately 3.7 % of the existing late-successional habitat in the Mt Ashland LSR will be removed with the implementation of the Ashland Watershed Protection and the Ashland Forest Resiliency Projects. Other actions proposed or expected to occur in the southern portion of the LSR include pre-commercial thinning in plantations, grazing, and dispersed recreation. These actions would have no impact to LSR components.

Cumulatively, the project will have effects to the Mt. Ashland LSR as it will remove or degrade up to 5.5 acres of late-successional forest. Due to the limited impacts to late-successional habitat, the action alternatives will not significantly increase the cumulative effects to the Mt. Ashland LSR and will not impact the ability of the LSR to provide a functional, interactive, late-successional and old-growth forest ecosystem.

3.2.4 Northern Spotted Owl Critical Habitat

The project will occur within two NSO critical habitat units (CHUs). NSO critical habitat was designated based on the identification of large blocks of suitable habitat that are well distributed across the range of the NSO (USDI Fish and Wildlife Service 1992a). CHUs are intended to identify a network of habitats that provide the functions considered important to maintaining stable, self-sustaining, and interconnected populations over the range of the NSO, with each CHU having a local, provincial, and a range-wide role in NSO conservation. Most CHUs were expected to provide suitable habitat for population support, though some were designated primarily for connectivity, and others were designated to provide for both population support and connectivity.

3.2.4.1 Analysis Methods

The evaluation of potential impacts to NSO critical habitat considers the effects to the PCEs (nesting, roosting, foraging, and dispersal habitat) (USDI Fish and Wildlife Service 1992a).

Primary constituent elements are the physical and biological features of critical habitat essential to a species' conservation. PCEs identified in the NSO critical habitat final rule include those physical and biological features that support nesting, roosting, foraging, and dispersal (USDI Fish and Wildlife Service 1992a). Features that support nesting and roosting habitat typically include a moderate to high canopy coverage (60%–90%); a multi-layered, multi-species canopy with large (>30” DBH) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (J. Thomas et al. 1990). Foraging habitat generally consists of attributes similar to those in nesting and roosting habitat, but may not always support successfully nesting pairs (USDI Fish and Wildlife Service 1992b). Dispersal habitat, at minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities: there may be variations over the owl’s range (e.g., drier sites in the east Cascades or northern California) (ibid.).

Please refer to Section 3.2.1.2 on p. 3-23 for additional analysis methods relevant to NSO Critical Habitat.

3.2.4.2 Affected Environment

The project will occur within CHUs CA-14 and the southern half of CHU OR-76 (Map 2). These units are contiguous, separated only by the California and Oregon state boundary. CHU OR-76 is divided into a north and south section by the Siskiyou Crest. Together these two CHUs encompass over 68,000 acres, approximately 23,000 of which is suitable NSO habitat (USDA Forest Service and USDI Bureau of Land Management 1994b). These CHUs are expected to support 20 NSO pairs over time and provide important intra- and inter-provincial connectivity (USDI Fish and Wildlife Service 1991).

Surveys over the past five years indicate that these CHUs are supporting between 12 to 14 pairs of NSOs; 30%–40% below the desired number of pairs. While NSO habitat is fairly abundant and contiguous in the northern half of CHU OR-76, it is more limited and patchy in CA-14 and the southern half of OR-76. Within the Project Area there are approximately 250 acres of nesting/roosting habitat, 2,500 acres of foraging habitat, and 5,800 acres of dispersal habitat.

3.2.4.3 Environmental Consequences

The effects of alternatives are divided into two sections which address the effects of the No Action and Action Alternatives separately. The effects of all Action Alternatives are similar in nature though they may differ in magnitude where specifically noted.

Effects of Alternative 1 – No Action

Under the No Action Alternative the PCEs of critical habitat would be slow in developing. FVS modeling indicates that 50 years from present stands will generally not provide the habitat components commonly associated with NSO nesting, roosting, or foraging habitat (See LSR No Action). Density-related mortality is expected to continue, with between 35 to 60% of the extant trees dying within that period. Thus, surface fuels are expected to dramatically increase over time. Additionally, in the event of a fire start, FFE modeling indicates general patterns regarding fire behavior and fire-induced tree mortality over time that are unacceptable relative to critical habitat objectives. Thus, the No Action Alternative increases the potential for fire to remove the existing physical and biological features important to functioning critical habitat and does little to promote the development of such characteristics.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning designed to promote the development of late-successional stands and the PCEs of NSO critical habitat will not remove important structural components of nesting, roosting, or foraging habitat such as large-diameter trees, snags, or DWD. A minimum of 60% canopy closure will be retained in existing nesting, roosting, or foraging habitat and 40% in dispersal habitat. Trees infected with mistletoe may be removed, but silvicultural prescriptions have been designed to ensure that this habitat component will remain on the landscape. Fuel reduction treatments have the potential to remove snags and DWD but prescriptions are designed to retain *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for these components where stand conditions permit and felling of snags > 20" or groups of snags will be limited to situations where they pose a hazard to operations.

To meet objectives for the Siskiyou Peak DFPZ under Alternatives 2 and 4, approximately four acres of foraging habitat will be downgraded to dispersal habitat in Stand 339. Outside of Stand 339, the removal of large-diameter trees would only occur under limited circumstances. Therefore, the number of large trees to be removed is expected to be minimal. The silvicultural prescriptions also ensure that the DFPZs will not result in large canopy gaps. Although some structural components of critical habitat may be reduced with the above actions, effects are not expected to change the function of NSO habitat outside of Stand 339 when assessed at the stand scale (i.e., stands providing foraging habitat will remain foraging quality post-treatment).

No temporary road or landing construction is proposed in nesting or roosting habitat. Construction of temporary roads and landings is expected to remove small patches (0.5 acre or less) of foraging habitat totaling between 3 and 5 acres and 16 to 35 acres of dispersal habitat in 0.5–2 acre patches. These acres represent approximately 0.1%–0.2% and 0.3%–0.6% of extant foraging and dispersal habitat in the Project Area, respectively. Because large DWD is an important structural component of NSO critical habitat and is generally lacking in the Project Area, all trees >24" that need to be felled for a temporary road will be left on site. More concentrated effects to dispersal habitat may occur in the upper portion of the Siskiyou Gap DFPZ, particularly under Alternatives 2 and 4. However, due to the existing amount of dispersal habitat within the Project Area, total acres of dispersal habitat to be removed, and the linear effects resulting from temporary spur construction, the dispersal function of CA-14 and OR-76 is not expected to be affected.

Because patches of foraging and dispersal habitat to be removed are small, impacts are dispersed across the Project Area, and the total acres of foraging and dispersal habitat to be removed is minimal, these actions are not expected to impact the ability of CA-14 and OR-76 to provide foraging opportunities or create barriers to NSO dispersal. Therefore, the action alternatives are not

expected to affect the ability of these CHUs to support NSO populations and provide intra- and inter-provincial connectivity.

Indirect Effects

Over time, thinning and fuel reduction treatments are expected to enhance the function of CHUs CA-14 and OR-76 by increasing the amount and distribution of nesting, roosting, foraging, and dispersal habitat and by reducing fuels to a level that would result in an acceptable fire behavior and post-fire stand condition. FVS modeling indicates that 50 years post-thinning, stands will exhibit characteristics typically associated with suitable NSO habitat (See LSR Indirect Effects).
Stands will also be less dense (averaging between 56 and 81 trees per acre) and will average between 216 and 257 ft^2 of BA per acre which is within the optimal range for NSO foraging habitat as reported by Irwin et al. (2004). FFE modeling indicates that stands will be more resistant to large-scale fires but will burn with sufficient intensity to create small openings within forested habitat. This type of pattern, which would create a mosaic of stands in different successional stages, would be consistent with patterns under historic fire regimes. Over time, this pattern would likely enhance critical habitat function by providing horizontal diversity of habitat across the landscape.

Cumulative Effects

According to USDA Forest Service and USDI Bureau of Land Management (1994b), there were 23,116 acres of suitable NSO habitat within CA-14 and OR-76 in 1994. Since that time only 74 acres of habitat has been removed (USDA Forest Service 2005a). Reasonably foreseeable actions in CA-14 and OR-76 south of the Siskiyou Crest include three KNF projects: Tennis Thin, Colestine, and plantation thinning projects, as well as grazing and dispersed recreation. The Tennis Thin project includes commercial thinning and fuels reduction in overstocked mixed conifer stands and the Colestine project includes commercial thinning in pine plantations. Pre-commercial thinning will also continue on plantations throughout the Project Area. None of these projects will remove suitable NSO habitat. Additionally, grazing and recreation are not expected to impact the PCEs of NSO critical habitat. North of the Siskiyou Crest reasonably foreseeable future actions include the Ashland Watershed Protection Project, the Mt. Ashland Ski Area Expansion, and the Ashland Forest Resiliency Project. The Ashland Watershed Protection Project will remove approximately 18 acres of suitable NSO habitat while the Mt. Ashland Ski Area Expansion will remove 44 acres. The Ashland Forest Resiliency Project is designed to restore more fire resilient forests in the Ashland watershed by implementing several types of hazardous fuels treatments. Approximately 1,000 acres of suitable NSO habitat will be removed or downgraded (nesting, roosting, and foraging habitat converted to dispersal habitat post-treatment) with the implementation of that project. There are no other actions proposed in these CHUs.

Cumulatively, the project will impact CA-14 and OR-76 by removing or downgrading between 3.3 and 9 acres of foraging habitat and 16 to 35 acres of dispersal habitat. These acres represent <0.1%

and up to 0.5% of extant foraging and dispersal habitat in these CHUs, respectively. Due to the limited impacts to the PCEs, the action alternatives will not significantly increase the cumulative effects to these CHUs regardless of other reasonably foreseeable future actions.

3.2.5 Northern Spotted Owl

The NSO was listed as Threatened under the ESA on June 26, 1990, due to widespread habitat loss and the inadequacy of existing regulatory mechanisms to provide for its conservation (USDI Fish and Wildlife Service 1990a).

3.2.5.1 Analysis Methods

Analysis methods have involved a combination of on-the-ground surveys, vegetation modeling, and the comparison of documented habitat criteria to pre- and post-treatment conditions. The Project Area and adjacent lands have been extensively surveyed over the past six years by KNF and USFWS personnel, private contractors, and private timber companies. Most recently, the second year of two-year protocol surveys were completed for the entire Project Area in 2007 (USDA Forest Service 2007p).

For cumulative effects analysis a new NSO habitat layer was created from 2005 digital orthophoto quads and field verification. Actions on private lands within the Project Area that occurred in 2005 were reviewed to identify activities that may have impacted NSO habitat after the photos were taken. All 2005 actions that impacted NSO habitat that were not captured by the photos and all 2006 activities were then used to revise the habitat baseline. Thus, the baseline acres of habitat discussed in this analysis include all past impacts to NSO habitat.

Please refer to Section 3.2.1.2 on p. 3-23 for additional analysis methods relevant to NSOs.

3.2.5.2 Affected Environment

NSOs generally inhabit older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging, and dispersal (Forsman et al. 1984; Gutiérrez 1996; LaHaye and Gutiérrez 1999). Specifically, habitat features that support nesting and roosting include a multi-layered, multi-species canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities or other types of deformities; numerous large snags; an abundance of large, dead wood on the ground; and open space within and below the upper canopy for NSOs to fly within (J. Thomas et al. 1990). BA within nest stands often exceeds 200 ft^2/acre (Solis and Gutiérrez 1990). Foraging habitat generally consists of attributes similar to those in

nesting and roosting habitat, but much variation exists over the NSO range. Recent research addressing NSO foraging habitat in California suggests that the BA of a stand influences use, with 160–240 ft^2/acre BA providing optimal foraging conditions (Irwin et al. 2004; Irwin et al. 2000). Dispersal habitat, at minimum, consists of stands with adequate tree size and canopy closure (>40%) to provide protection from avian predators and some foraging opportunities (USDI Fish and Wildlife Service 1992a).

Recent landscape-level analyses suggest that in the southern portion of the subspecies' range a mosaic of large patches of late-successional habitat interspersed with other vegetation types may benefit NSOs more than large, homogeneous expanses of older forests (Franklin et al. 2000; Olson et al. 2004). Franklin et al. (2000) hypothesized that a mosaic of different vegetation and seral stages may offer a stable prey resource for NSOs while providing adequate protection from predators. Franklin et al. (2000) and Dugger et al. (2005) also reported habitat fitness potential for NSOs was greater where large amounts of older forest were present in the NSOs core area.

Results of the January 2004 NSO Demographic Meta-analysis Workshop indicate that across the range of NSO, populations declined at an average of approximately 3.7% per year from 1985–2003 (Anthony et al. 2006). Populations on the demographic study areas closest to the Project Area, (Oregon south Cascades and northwestern California) appear to be relatively stable, though experiencing a slight decline during the same time period (ibid.).

Historic timber harvest within the Project Area has likely impacted NSOs by removing habitat suitable for nesting, roosting, or foraging. Additionally, the stands that have regenerated following timber harvest typically lack the structural attributes and diversity necessary to support nesting pairs (multi-layered and multi-species canopies; large, decadent trees and snags; and large DWD). Past timber harvest has also reduced the amount and recruitment of important habitat components of NSO prey such as large-diameter snags and DWD.

Extant suitable NSO habitat covers about 20% of the Project Area and includes approximately 250 acres of nesting/roosting habitat and 2,500 acres of foraging habitat. Habitat estimates are based on the KNF NSO habitat layer, 2005 digital orthophoto quads, and field reconnaissance. Nesting/roosting habitat occurs in small (<25 acres), widely scattered patches. Due to the size of nesting habitat patches, the amount of edge between nesting and other habitats may be indicative of low habitat fitness potential. Foraging habitat is more widely distributed and occurs in somewhat larger blocks.

The estimated home ranges (1.3 mile radius or 3,300 acres in the California Klamath Province) of 13 historic activity centers overlap the Project Area and have actions proposed within their boundaries. The amount and quality of habitat within the core areas and home ranges is highly variable. Existing

habitat within nine of these estimated home ranges is below the level (1,336 acres) at which NSO abundance is expected to decrease and productivity is anticipated to be impaired. Additionally, eight of the core areas lack large amounts or contiguous blocks of nesting and roosting habitat.

The Project Area and adjacent lands have been extensively surveyed over the past six years by KNF and USFWS personnel, private contractors, and private timber companies. Results of these surveys indicate that occupancy and reproductive rates are highly variable at historic sites between years but low over the six-year period (USDI Fish and Wildlife Service 2007a; USDA Forest Service 2007p). Low occupancy and reproductive rates observed over the last six years may be indicative of the amount and size of nesting habitat patches within core areas.

In 2007, the second year of protocol surveys was completed, which covered the 13 historic activity centers that overlap with Project Area. These surveys indicate that occupancy and reproductive rates were relatively high during this two-year period; 66% of historic sites were occupied in 2006 and 77% were occupied in 2007. Reproduction occurred at a total of three sites in 2006 and 2007. Because reproductive rates, and to a lesser degree, site occupancy, have been shown to exhibit substantial annual variation (Loschl 2004; Olson et al. 2004; Olson et al. 2005; Anthony et al. 2006), data from two years can not be interpreted as a trend in occupancy and reproduction rates within the Project Area.

The effects of drought, overstocking of stands, and years of fire exclusion have put NSO habitat within the Project Area at an unacceptable risk of a wildfire. Because NSO habitat is limited within the Project Area, wildfires that remove habitat could impact the ability of NSO to occupy this area.

3.2.5.3 Environmental Consequences

The effects of alternatives are divided into two sections which address the effects of the No Action and Action Alternatives separately. The effects of all Action Alternatives are similar in nature though they may differ in magnitude where specifically noted.

Effects of Alternative 1 – No Action

In the absence of large-scale natural disturbance it is unlikely that the amount of NSO habitat in the Project Area will significantly change in the near future. FVS modeling indicates that 50 years from the present, stands will generally not provide the habitat components commonly associated with NSO nesting, roosting, or foraging habitat (see p. 3-32). Thus, under the No Action Alternative, many stands would require greater than 50 years to become NSO habitat. Density-related tree mortality is expected to continue, with 35%–60% of the extant trees dying within that period. Thus,

surface fuels are expected to dramatically increase over time. Additionally, in the event of a fire start, FFE modeling indicates general patterns regarding fire behavior and fire-induced tree mortality over time (see p. 3-32) that would be detrimental to NSO habitat. Thus, the No Action Alternative increases the potential for wildfire to remove existing NSO habitat and potentially impact recruitment of important habitat components such as large DWD for decades.

*Effe*cts of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning designed to promote the development of late-successional stands will not remove important structural components of nesting, roosting, or foraging habitat such as large-diameter trees, snags, and DWD. A minimum of 60% canopy closure will be retained in existing nesting, roosting, or foraging habitat and 40% in dispersal habitat. Where existing stand conditions permit, >200 ft^2 BA/acre will be retained in nesting or roosting habitat and >160 ft^2 BA/acre will be retained in foraging habitat. Site-specific silvicultural prescriptions will ensure that mistletoe brooms remain on the landscape, particularly on the lower half of north and east facing slopes where probability of nesting is greatest. Fuel reduction treatments have the potential to remove snags and DWD. However, fuel reduction prescriptions are designed to retain *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for these components where stand conditions permit.

To meet objectives for the Siskiyou Peak DFPZ under Alternatives 2 and 4, approximately 4 acres of foraging habitat will be downgraded to dispersal habitat in Stand 339. These acres occur along a high elevation ridge top, a landscape feature not typically used by foraging NSOs (Irwin et al. 2004; Irwin et al. 2000). Outside of Stand 339, the removal of large-diameter trees would only occur under limited circumstances. Additionally, thinning in DFPZs will meet the canopy retention requirements for NSOs discussed above and will not result in large canopy gaps. Therefore, the number of large trees to be removed is expected to be minimal and would not change the function of any stands (i.e., stands that provide foraging habitat would continue to provide foraging habitat post-harvest). Additionally, the incorporation of *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and DWD where stand conditions permit, and by limiting the felling of snags > 20” or groups of snags to situations where they pose a hazard to operations, will ensure that these components will be retained.

Temporary road and landing construction is expected to remove between 3 and 5 acres of foraging habitat and 16 to 35 acres of dispersal habitat. Foraging and dispersal habitat proposed to be

removed occurs in patches of 0.5 acre or less and 0.5–2 acres, respectively. These acres represent approximately 0.1%–0.2% and 0.3%–0.6% of extant foraging and dispersal habitat in the Project Area, respectively. Because large DWD is an important component of NSO foraging habitat, all trees >24" that need to be felled for a temporary road will be left on site.

Foraging habitat will be removed or downgraded from seven NSO home ranges that currently contain limited amounts of habitat (KL1178, KL1180, KL1188, KL1189, KL1190, KL1310, KL1311). However, only 0.2–0.5 acres of foraging habitat would be removed from any one NSO core area and between 0.5 and 6 acres would be removed or downgraded from any one NSO home range. These acres represent <0.1% to approximately 1.1% of the extant suitable habitat within these NSO core areas and home ranges, respectively. Also, it is unlikely that the 4 acres of foraging habitat to be downgraded in Stand 339 (Alternatives 2 and 4 only), which occurs in the home ranges of KL1188 and KL1189, provide quality foraging habitat due to the physiographic location of these acres. Therefore, because patches of foraging habitat to be removed are small and generally occur in the outer portion of any given home range, foraging habitat to be downgraded in Stand 339 has low intrinsic value, and impacts to foraging habitat are dispersed across the Project Area, the removal and downgrading of foraging habitat is not expected to impact foraging opportunities for NSOs.

Case studies examining the foraging activity of NSOs before and after thinning are limited. Meiman et al. (2003) reported that commercial thinning adjacent to an active NSO nest resulted in the expansion of the males' home range and a shift in the post-harvest core area use. Another experimental study (Irwin et al. 2000; Irwin pers. comm.) reported that some owls shifted their activity centers closer to thinned units while other owls moved their site centers away from treated stands. However, no changes in home range sizes attributable to thinning treatments were detected. The equivocal results of these studies make inferences for this project difficult. However, Irwin et al. (2000) noted that the size class of trees and the amount of BA remaining post-treatment influenced habitat used by foraging owls. Because thinning and fuel reduction prescriptions for the project are designed to retain stand conditions within the optimal range used by foraging owls (largest trees retained for160 to 250 ft^2 BA per acre where existing stand conditions permit), impacts to patterns of habitat use by NSOs are expected to be minimal and of short duration.

In general, impacts to dispersal habitat will be diffused throughout the Project Area; however, more concentrated effects to dispersal habitat may occur in the upper portion of the Siskiyou Gap DFPZ, particularly under Alternatives 2 and 4. Due to the small patch size and amount of existing dispersal habitat within the Project Area, the removal of 16 to 35 acres of dispersal habitat is not expected to create any dispersal barriers for NSOs.

Thinning and fuel reduction treatments have the potential to impact food and cover for some NSO prey species by removing snags and DWD. Prescriptions are designed to meet *Mt. Ashland Late*

Successional Reserve Assessment (USDA Forest Service 1996a) recommendations for these habitat components. Where thinning and fuel reduction treatments similar to those proposed in this project have been applied, effects to the abundance of NSO prey species and their forage have been shown to be insignificant or of short duration (Waters et al. 1994; Carey and Wilson 2001; Suzuki and Hayes 2003; Gomez et al. 2005). Additionally, the prescriptions for thinning and fuels treatments (variable density thinning, retention of snags and DWD) are consistent with the recommendations by Lehmkuhl et al. (2006a, 2006b) for maintaining habitat for northern flying squirrels and woodrats in northern interior forests while managing for fire and healthy forest ecosystems. To further ensure the distribution of NSO prey will not be significantly impacted by fuel reduction treatments, Project Conservation Measures limit the amount of NSO habitat that can be included within proposed underburn perimeters annually to <35% of the suitable habitat within a NSO core area and <25% of the suitable habitat within a home range. Thus, effects to NSO prey species abundance and distribution are expected to be minimal.

Thinning and fuels reduction activities also have the potential to create smoke and noise above ambient levels. To ensure that breeding NSOs are not disturbed by activities that create noise above ambient levels, a seasonal restriction of February 1st to July 9th will apply to these activities when they occur within 0.25 mile of an active nest site or unsurveyed nesting/roosting habitat. To ensure that breeding NSOs are not affected by the intrusion of smoke into their nest stand, a seasonal restriction of February 1st to July 31st will apply to activities that create smoke within 0.25 mile of an active nest site or unsurveyed nesting/roosting habitat. Dates for seasonal restrictions cover the time period from which adult owls typically initiate breeding activity to the point where juvenile owls are physically capable of moving away from such disturbances.

It is unclear whether forest management has an effect on the outcome of interactions between barred owls and NSO (Gutiérrez et al. 2004). However, due to the limited impact to NSO habitat and their prey, it is unlikely that the proposed thinning and fuel reduction treatments will have an effect on influencing the likelihood of such potential interactions.

Indirect Effects

Over time, thinning and fuel reduction treatments are expected to have benefits to NSOs by increasing the amount and distribution of nesting, roosting, foraging, and dispersal habitat and by reducing fuels to a level that would result in an acceptable fire behavior and post-fire stand condition. FVS modeling indicates that 50 years post-thinning, stands will exhibit characteristics typically associated with suitable NSO habitat (See LSR Indirect Effects) (Solis and Gutierrez 1990; LaHaye and Gutierrez 1999). Stands will also be less dense (averaging between 56 and 81 trees/acre) and will average between 216 and 257 ft^2 of BA per acre which is within the optimal range for NSO foraging habitat as reported by Irwin et al. (2004). FFE modeling indicates that stands will be more resistant to large-scale fires but will burn with sufficient intensity to create small openings within

forested habitat. This type of pattern, which would create a mosaic of stands in different successional stages, would be consistent with patterns under historic fire regimes. This pattern would likely benefit NSOs by providing horizontal diversity of habitat across the landscape.

Cumulative Effects

This cumulative effects analysis considers the effects to NSOs within the Project Area as well as the effects within the estimated 1.3 mile home range of NSOs that overlap with project treatments. During the railroad logging era (1910–1932) the Project Area was privately owned and was extensively harvested. At the conclusion of that era, NSO habitat in the Project Area was limited to higher elevation true fir stands and scattered pockets of mixed conifer at lower elevations. After acquiring much of the railroad logged area in land exchanges, the KNF conducted partial cuts and clearcuts during the 1950s–1970s, further contributing to changes in distribution and abundance of NSO habitat. Timber harvest on private lands has also reduced the amount and distribution of suitable habitat for NSOs within the analysis area.

Reasonably foreseeable future actions within the Project Area include small-scale timber harvest on private lands. Within these areas, suitable habitat is not abundant and consists primarily of foraging or dispersal habitat. Although proposed activities would not likely remove habitat in these areas, these activities will likely degrade existing habitat. Outside of the Project Area but within the estimated 1.3 mile home range of NSOs that overlap with project treatments, there are three timber harvest plans, Bumblebee, Hungry Youth, and North Klamath expected to be implemented in the reasonably foreseeable future. The Bumblebee timber harvest plan is expected to remove approximately 25–30 acres of foraging habitat from two NSO home ranges (4 acres from KL1167 and 25 acres from KL1267). Due to the extant amount of habitat in these home ranges, this action is not expected to have a significant impact to NSOs. Approximately 400 acres of the Hungry Youth timber harvest plan overlaps with the NSO analysis area. These acres contain roughly equal amounts of foraging and dispersal habitat. Although silvicultural prescriptions for the Hungry Youth timber harvest plan have not yet been finalized, it is expected that approximately 25% of the timber harvest plan will be in clearcut patches (Staley pers. comm.). Thus it is reasonable to conclude that the Hungry Youth timber harvest plan would remove up to 50 acres of foraging habitat from the home range of KL1169 and up to 5 acres from the home range of KL1176. A similar amount of dispersal habitat would also be expected to be removed from these home ranges. The North Klamath timber harvest plan will remove approximately 10 acres of foraging habitat from the home ranges of KL1167 and KL1190. Due to the existing amount of habitat in these home ranges these impacts are not expected to be significant. Other planned projects or activities expected to occur on federal land within the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. These activities are not expected to impact NSO habitat.

Cumulatively, NSOs may be impacted by the removal or downgrading of between 94 and 99 acres of foraging habitat and 75–85 acres of dispersal habitat from 11 home ranges. However, the majority of foraging habitat to be removed occurs outside of NSO core areas and in home ranges that will retain adequate amounts of suitable habitat post-harvest. Additionally, the cumulative acres of habitat removed or downgraded represent 1.3 % and 0.7 % of extant foraging and dispersal habitat in the NSO analysis area, respectively. Due to the limited impacts to habitat, the cumulative effects are not expected to significantly impact foraging opportunities or create barriers to NSO dispersal.

3.2.6 Bald Eagle

There are no known nest sites, roost sites, rivers, or large bodies of water suitable for bald eagle *(Haliaeetus leucocephalus)* foraging in the Project Area. Although large, mature trees suitable for nesting and roosting exist in the Project Area, their distance from the lower Beaver Creek and Klamath River likely precludes their use. Thus, the proposed alternatives will likely have no effect on bald eagles.

3.2.7 Peregrine Falcon

Peregrine falcon *(Falco peregrinus)* is listed as a Region 5 Sensitive Species. Field review by USFWS personnel determined that there are no large rocky cliffs or outcrops suitable for peregrine falcon nest sites within the Project Area. Thus, the proposed alternatives will likely have no effect on peregrine falcons.

3.2.8 Northern Goshawk

Northern goshawk *(Accipiter gentilis)* is listed as a Region 5 Sensitive Species. Surveys were conducted in 2005–2007 in the areas of highest quality habitat outside of the historic Flystain Creek territory with no detections (USDI Fish and Wildlife Service 2007a). Additionally, no goshawks were detected during project field reviews or during NSO surveys (Johnson pers. obs.). This, combined with conservation measures specified in Section 2.3.2.1, will likely result in no effect to northern goshawks. Project conservation measures and Standards and Guidelines from the LRMP implemented for goshawks (8-20) ensure that the action alternatives will either meet habitat retention standards or have no impact to existing habitat, and will not likely disturb normal behavior of northern goshawks.

3.2.9 Great Gray Owl

Great gray owl (*Strix nebulosa*) is listed as a Region 5 Sensitive Species. Surveys were conducted by biologists from the Rogue River-Siskiyou National Forest on the Siskiyou Crest in the vicinity of Mt. Ashland, with no owls detected (Clayton pers. comm.). Although surveys did not find great gray owls in the vicinity of the Project Area, great gray owls are difficult to detect and negative surveys do not necessarily mean owls are absent; owls may be rare in the area and/or were not detected during the survey effort (Godwin pers. comm.). Additionally, not all potential great gray owl habitat in the Project Area was covered by these surveys. An incidental sighting of a great gray owl occurred in the vicinity of the Siskiyou Crest near Mt. Ashland in 2005 (Oakley pers. comm.), but the territorial status of that owl is not known. The closest confirmed great gray owl nest sites to the project occur approximately 8 miles to the west in the Applegate River drainage, and 14 miles to the northeast on the Dead Indian Plateau of southern Oregon (Godwin pers. comm.).

Great gray owl habitat within the Project Area consists of high elevation, mature true fir stands with open to moderately-closed canopies. Many of these stands contain nesting platforms in the form of broken-topped trees or snags and are adjacent to naturally occurring meadows exhibiting pocket gopher and vole mounds and tunnels (Johnson pers. obs.). Approximately 300 acres of potential forested habitat adjacent to meadows occurs within the Project Area. The amount of great gray owl habitat in the area will not be affected.

Conservation measures specified in Section 2.3.2.1 will result in very low chance of any effect to great gray owl as a result of any of the action alternatives.

3.2.10 Willow Flycatcher

Willow flycatchers *(Empidonax trailii)* are listed as a USFS Region 5 Sensitive Species due to the loss and degradation of riparian shrub habitats throughout its range, cowbird nest parasitism, and livestock grazing.

3.2.10.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23

3.2.10.2 Affected Environment

Willow flycatchers have been captured at the Monitoring Avian Productivity and Survivorship banding station in large willow thickets at Seiad Valley along the Klamath River over the past 11

years (Cuenca pers. comm.). This mist-netting station is approximately 19 miles from the Project Area. Both adults and juveniles have been captured, indicating the species breeds in the Siskiyou Mountains. Willow flycatchers have also been detected during songbird surveys in the southern portion of the Mt. Ashland LSR (Cuenca pers. comm.).

Within the Project Area, suitable habitat for willow flycatchers consists of small (typically <1 acre in size), isolated patches of willow and/or alder. These patches of habitat are located within Riparian Reserves and are scattered throughout the Project Area.

3.2.10.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of willow flycatcher habitat in the Project Area will significantly change in the near future.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Although prescribed fire will not be ignited in Riparian Reserves, underburns will be allowed to back into them. Thus, an unknown but potentially appreciable amount of willow flycatcher habitat may be underburned. Because underburns are designed to imitate low-intensity fire, and shrubs such as willow and alder often become established following a disturbance (Petrides 1992), any impacts to willow flycatcher habitat are expected to be short term.

Indirect Effects

FFE modeling indicates that thinning and fuels treatments will result in fires of less intensity, reducing the risk that habitat will be lost in the event of a fire.

Cumulative Effects

Reasonably foreseeable future actions in the Project Area include small scale timber harvest on private lands. However, measures are being taken to ensure that impacts to riparian habitat are minimized. Other ongoing federal projects in the Project Area include grazing, ongoing pre-commercial thinning in existing plantations and dispersed recreation. Pre-commercial thinning and recreation are not expected to impact willow flycatcher habitat. While grazing will likely continue to impact willow flycatcher habitat, the current level of grazing in the Project Area is not expected to

have a significant affect as grazing allotments limit the number of livestock in the area. Thus, the cumulative effects to willow flycatchers are expected to be minimal.

3.2.11 Wolverine

Wolverines *(Gulo gulo luteus)* are listed as a USFS Region 5 Sensitive Species due primarily to naturally low population densities that have been impacted by trapping, human disturbances (roads, logging), and overgrazing in high mountain meadows.

3.2.11.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23

3.2.11.2 Affected Environment

Numerous carnivore surveys have been conducted adjacent to the Project Area in the Rogue-Siskiyou Nation Forest, the KNF, and on private lands in northern California in the past decade, including: over 150 baited camera stations on the Cascade Zone of the Rogue River National Forest and baited stations in the Ashland Watershed (USDA Forest Service 2005a); 12 track plate and camera stations that were periodically monitored by the KNF on the Oak Knoll and Scott River Ranger Districts from 1992 to 1996 (USDA Forest Service n.d.(a)); 60 track plate stations monitored by the USFWS on the Oak Knoll and Scott River ranger districts in 2005 and 2006 (Yaeger pers. comm.);19 4-square-mile survey areas in the Collins-Baldy LSR in 2004 (Farber and Franklin 2005); and 21 4-square mile survey areas in the Mt. Ashland LSR and adjacent private lands (Farber and Criss 2006). None of these efforts detected wolverines.

There have been unconfirmed sightings of wolverines on the Scott River Ranger District, on Scott Bar Mountain, and in the Canyon Creek watershed approximately 26 miles southwest of the Project Area. However, there are no historic records of this species in the Project Area. Due to the large home ranges used by wolverines, their ability to travel long distances over rugged terrain, the variety of habitats that they use, and the proximity of remote, rugged habitats in Wilderness areas, it is expected that wolverines may disperse into, or forage in the Project Area, either as part of individual home ranges or as individuals dispersing through the area. Based on home range sizes and limited intrasexual territoriality of the species, there is the potential that one reproductive unit (1 male and 1 or more females) overlaps with the action area.

3.2.11.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance, it is unlikely that the amount of wolverine habitat in the Project Area will significantly change in the near future. FVS modeling indicates that important structural components for denning and cover such as large-diameter DWD will be slow in developing. Additionally, FFE modeling indicates a pattern of fire behavior and fire-induced tree mortality over time that would increase the likelihood that these habitat components would be removed in the event of a fire.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Thinning in DFPZs, fuels treatments, and temporary road construction may remove individual snags or large DWD that may be used for cover or denning. However, due to the size of a wolverine home range and prescriptions that are designed to retain *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and DWD, impacts to wolverine habitat are expected to be negligible. The above activities will employ heavy machinery and may require repeated visits to a site. Because wolverines are sensitive to human disturbance, these activities will likely prevent wolverines from using the Project Area during implementation. Thus, normal movement patterns or foraging activities may be disrupted.

Indirect Effects

Thinning is expected to have long-term benefits to wolverines (if present) by promoting the development of late-successional habitat. Additionally, FFE modeling also indicates that the proposed thinning and fuels treatments would change expected fire behavior over time, resulting in fires of less intensity, thus, reducing the potential that existing wolverine habitat will be removed. By reducing the density of overstocked stands, thinning may also improve habitat for deer, an important prey species.

Cumulative Effects

Past effects to wolverine habitat in the Project Area are similar to those described for NSOs. Reasonably foreseeable future actions in the Project Area include small scale timber harvest on private lands. These activities will likely remove wolverine habitat components but impacts are not expected to be significant. Other federal projects or activities expected to occur in the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation.

By introducing a large amount of human disturbance on the landscape, these cumulative actions may preclude the use of portions of the Project Area by wolverines.

3.2.12 Pacific Fisher

Pacific fisher *(Martes pennanti)* is a USFS Region 5 Sensitive Species due to the loss and fragmentation of habitat across California, as well as the fact that they are easily trapped.

3.2.12.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.12.2 Affected Environment

Fisher home range size is variable and likely reflects habitat quality (Zielinski et al. 2004a). Using studies from across the United States, Powell and Zielinski (1994) calculated a mean home range size of approximately 25 square miles (16,000 acres) for males and 10 square miles (6,400 acres) for females.

Habitat for fisher is typically characterized as mature, structurally complex, conifer and mixed conifer-hardwood forest (Buskirk and Powell 1994; Zielinski et al. 2006). Den sites are usually located in forested stands with complex structural characteristics typical of late-successional forests including large trees and snags, multi layered vegetation, large woody debris, and high canopy closure (Powell and Zielinski 1994; Lewis and Stinson 1998; Aubry and Raley 2006). Fishers typically choose structurally diverse, closed canopy forests with the largest woody structure (both live trees and snags) available for their daily resting bouts (Powell and Zielinski 1994; Zielinski et al. 2004b; Zielinski et al. 2006). Habitat used for foraging is more likely associated with the structural attributes that lead to abundant prey and reduced vulnerability to predation and can be fulfilled at locations that do not have mature forest elements (Powell 1993; Truex and Zielinski 2005). Refer to the Project Wildlife Specialist Report (Johnson 2007) and the addendum to that report (Johnson 2008) for a detailed discussion of fisher habitat.

Numerous studies have shown that fisher avoid areas with little (<40%) or no forest cover (Rosenberg and Raphael 1986; Jones and Garton 1994; Dark 1997). However, it is assumed that fishers will use patches of habitat that are connected by forested stands, but will not likely use patches of habitat that are separated by large openings or areas lacking adequate canopy cover (Buskirk and Powell 1994). Fisher also frequently use riparian areas as travel corridors (Jones and Garton 1994; Slader et al. 1994). In their 12-month finding, the USFWS recognized that timber

harvest and fuels treatments can destroy, alter, or fragment fisher habitat and that habitat loss and fragmentation appear to be significant threats to the fisher (USDI Fish and Wildlife Service 2004).

Based on the above description of fisher habitat there are approximately 1,300 acres of structurally diverse stands that provide fisher denning and resting habitat within the Project Area. This habitat occurs in the higher elevation true fir and mixed conifer stands and scattered pockets of mid-elevation mixed conifer stands. Within the high elevation true fir and mixed conifer there are approximately 500 acres of denning and resting habitat. The only contiguous block (>50 acres) of denning and resting habitat occurs in the extreme northeast corner of the Project Area in the true fir zone. Denning and resting habitat in the mid-elevation mixed conifer zone is distributed in small patches (typically 25 acres or less) and totals approximately 800 acres. Other potential denning and resting sites occur in second growth stands where large, residual components of the original stand exist. Potential foraging habitat is more widely distributed and occurs in larger blocks.

Numerous carnivore surveys have been conducted within and adjacent to the Project Area on the KNF and on private lands in the past decade. Most recently, Farber and Criss (2006), recorded a detection of a fisher in a high elevation, mature true fir stand in the extreme northeast corner of the Project Area. Their remaining 11 camera stations located within the Project Area failed to detect fishers. Farber and Criss detected fisher at six other camera stations approximately 3.5–7 miles west and southwest of the Project Area. Numerous other detections of fisher have occurred within 10 to 12 miles, south and southwest of the Project Area (Farber and Franklin 2005; Yaeger pers. comm.).

3.2.12.3 Environmental Consequences

Effects of Alternative 1 – No Action

Under the No Action Alternative, high-quality, structurally-complex fisher habitat would be slow in developing. FVS modeling indicates that 50 years from present stands will still be dense (>340 trees and 285 ft^2 BA/acre), dominated by trees <12.5” DBH, and contains <9 trees per acre >30”. Although these stands would have a high canopy closure and scattered denning and resting sites, they would still not resemble the complex structural characteristics typically associated with high-quality fisher habitat. Additionally, density-related tree mortality is expected to continue, with between 35 and 60% of the extant trees dying within that period. Thus, surface fuels are expected to dramatically increase over time. In the event of a fire start, FFE modeling indicates several general patterns regarding fire behavior and fire-induced tree mortality over time including (1) a constant or increasing crown fire potential under both moderate and severe weather conditions, (2) an increase in surface fire intensity under both moderate and severe weather conditions, and (3) either a constantly high or increasing level of BA mortality. Thus, the No Action Alternative does little to

promote the development of fisher habitat and increases the potential for fire to remove existing fisher habitat.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning designed to promote the development of late-successional habitat will not remove important structural components of fisher habitat such as large-diameter trees, snags, and DWD. Silvicultural prescriptions will ensure that mistletoe brooms are retained on the landscape. Thinning prescriptions are designed to retain a minimum canopy closure of 60% in existing NSO nesting, roosting, or foraging habitat. Because fisher denning and resting habitat is a subset of suitable NSO habitat, thinning will not significantly reduce canopy cover in these fisher habitats. Additionally, thinning prescriptions are designed to retain an average of 40%–60% canopy across the landscape depending on aspect and slope position, leave a minimum of 15% of each stand unthinned, and limit actions within 170 feet of riparian areas to precommercial thinning. Thus, habitat connectivity for fisher is not expected to be significantly affected.

Under Alternatives 2 and 4, thinning to create the Siskiyou Gap DFPZ would remove approximately 4 acres of denning and resting habitat in stand 339 by reducing canopy cover to 40%. Outside of stand 339, silvicultural prescriptions have been designed to retain suitable NSO habitat where it occurs within DFPZs, ensuring that these activities will not remove any additional denning and resting habitat. Outside of stand 339, the removal of large-diameter trees for DFPZs would only occur under limited circumstances, the removal of large snags or groups of snags will be limited to situations where they pose a hazard to operations, and where consistent with DFPZ objectives large-diameter DWD will be retained. Prescriptions for other fuel reduction treatments have also been designed to retain *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and DWD. Thus, fuel reduction treatments are not expected to have a significant impact to the structural components of fisher denning and resting habitat.

Between 0.2 to 0.3 miles of temporary road construction is proposed in fisher denning and resting habitat. Because construction of temporary roads would remove large diameter trees and create approximately a thirty foot gap in the canopy, it is expected that this activity would remove 0.7–1.1 acres of denning and resting habitat and 5–24 acres of foraging habitat. While the construction of temporary roads will create linear openings in forested stands, research suggests that narrow roads with low traffic volume, such as logging roads, do not influence home range establishment, daily movement patterns, or use of otherwise suitable habitat (Dark 1997; Aubry and Raley 2006).

Therefore, the construction and subsequent decommissioning of temporary roads is not expected to create barriers to fisher movements or measurably affect habitat connectivity. If trees >24" need to be felled for construction of temporary roads they will be left on site. One landing is proposed to be constructed in fisher denning and resting habitat under Alternatives 2, 4, and the Preferred Alternative, resulting in the removal of 0.5 acre of habitat.

Combined, proposed project activities would only remove 0.7–5.5 acres or 0.05%–0.43% of extant fisher denning and resting habitat in the Project Area and would not be expected to measurably impact habitat connectivity. At the scale of a fisher's home range, this level of habitat modification would be negligible and not expected to affect the viability of fisher in the Project Area.

Thinning and fuels treatments also have the potential to impact some fisher prey species by removing or reducing the availability of important habitat components. However, where thinning treatments similar to those proposed in this project have been applied, effects to small mammal species commonly found in fisher diets have been shown to be insignificant or of short duration (Carey and Wilson 2001; Suzuki and Hayes 2003).

Indirect Effects

Thinning and fuels treatments are expected to have significant benefits to fisher by increasing the amount and distribution of denning and resting habitat and by reducing fuels to a level that would result in an acceptable fire behavior and post-fire stand condition. FVS modeling indicates that 50 years post-thinning, stands will typically exhibit the structural complexity commonly associated with fisher habitat (p. 3-33). FFE modeling indicates that stands will be more resistant to large-scale fires but will burn with sufficient intensity to create small openings within forested habitat. This type of pattern, which would create a mosaic of stands in different successional stages, would be consistent with patterns under historic fire regimes. Over time, this pattern would likely enhance habitat for fisher and their prey by providing horizontal diversity of habitats across the landscape.

The average tree diameter within a stand would increase to between 24 and 27" and 14 to 15 trees per acre >30" would be expected. More large stems per acre would also increase recruitment of large snags and DWD. Stands with this type of structural complexity contain the specific habitat requirements for this species. FFE modeling indicates that thinning and subsequent fuels treatment will generally reduce crown fire potential and maintain vertical fuels structures favoring surface fires and significantly reduce predicted stand mortality in the event of a fire start. These factors indicate that stands will be more resistant to large-scale fires but will burn with sufficient intensity to create small openings within forested habitat. This type of pattern would create a mosaic of stands in different successional stages, be consistent with patterns under historic fire regimes, and would likely benefit fisher by creating horizontal diversity of habitat across the landscape.

Cumulative Effects

Because the fisher is a wide ranging species with a large home range size, the cumulative effects analysis area for this species includes the Project Area plus a 1.5–2 mile buffer around the project (equivalent to the project's NSO analysis area) as well as the north zone of the Mount Ashland LSR (portion of the LSR north of the Siskiyou Crest). This analysis area was selected because it allows for a more complete analysis of effects to potential fisher home ranges that may overlap with and be impacted by project activities and because this area could hypothetically support a small localized population of seven or more individuals.

The Project Area is predominately federal lands with small in-holdings of private ownership. Much of the Project Area is bounded by industrial timber lands. Prior to European settlement the majority of the Beaver Creek watershed, which includes the Project Area, was late-successional mixed conifer forest. During the railroad logging era (1910–1932) the Project Area was privately owned and was extensively harvested—an estimated 90% of the trees were removed. During this era pine was the preferred species with the largest trees on the landscape being targeted for removal. Thus, at the conclusion of the railroad logging era fisher habitat in the Project Area was limited to higher elevation true fir stands and scattered pockets of mixed conifer at lower elevations. After acquiring much of the railroad logged area in land exchanges, the KNF conducted partial cuts during the 1950s–1970s, further contributing to changes in distribution and abundance of fisher habitat. Similar to railroad logging, KNF partial cuts primarily targeted large trees but did not focus on pine. Although the extent of impacts to fisher habitat on the small in-holdings of privately owned lands within the Project Area is unknown, it is expected that important components of fisher habitat have been removed.

The majority of land within the buffer around the Project Area (approximately 28,000 acres) is owned by industrial timber companies or managed by the KNF. Federally owned lands in this zone have also been impacted by railroad logging and/or KNF partial cuts. Industrial timber company lands in this zone have been and continue to be actively managed. While it is difficult to quantify the actual impacts to fisher habitat, it is reasonable to conclude that past and current timber management on these lands has reduced the abundance and distribution of fisher habitat. Currently there are approximately 1,950 acres of fisher denning and resting habitat in the buffer area surrounding the Project Area.

Primarily because a large portion is allocated as the Ashland watershed, timber harvest in the north zone of the LSR has been relatively limited (USDA Forest Service 1996a). Within the Ashland watershed, timber harvest has been limited to small clear cuts adjacent to the 2060 road, thinning to create shaded fuelbreaks, individual and small group selection to reduce fire hazard, and roadside salvage. To the east and west of the Ashland watershed, harvest has been more extensive and impacts to fisher habitat have likely been greater. According to the *Mt. Ashland Late Successional*

Reserve Assessment (USDA Forest Service 1996a), there were approximately 8,370 acres of late-successional habitat in the north zone in 1996. Because the above description of fisher denning and resting habitat closely resembles late-successional habitat as defined in the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) [structurally complex stands with canopy closure usually greater than 60%, and average stem diameter >24" below 5000' with smaller average tree diameter (< 24") and less understory above 5000'], and there has not been any measurable loss of late-successional habitat since 1996, the *Mt. Ashland Late Successional Reserve Assessment* (ibid.) account of late-successional habitat represents a reasonable approximation of the extent and distribution fisher habitat in the north zone of the LSR. Therefore, it is estimated that there is approximately 11,600 acres of fisher denning and resting habitat in the fisher analysis area (3,250 acres in the NSO analysis area and 8,370 acres in the north zone of the LSR).

Reasonably foreseeable future actions within the Project Area include small scale timber harvest on private lands. Based on aerial photo interpretation, fisher denning and resting habitat do not appear to occur in these areas. In the buffer zone surrounding the Project Area, three timber harvest plans, Bumblebee, Hungry Youth, and North Klamath are proposed. Harvest units within these timber harvest plans generally lack the mature, structurally complex stands typical of fisher denning sites, however, some structure that is suitable for resting bouts will likely be removed. Because significant portions of these plans are to be clearcut or harvested using a shelterwood prescription, it is expected that approximately 110 acres of fisher foraging habitat will be removed. Despite these impacts, foraging habitat will remain well distributed in this zone. Other federal projects or activities planned in the Project Area and the buffer surrounding the project include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. These activities are not expected to impact fisher habitat.

In the north zone of the Mount Ashland LSR, reasonably foreseeable future actions include the Ashland Watershed Protection Project, the Mt. Ashland Ski Area Expansion, and the Ashland Forest Resiliency Project. The Ashland Watershed Protection Project and the Mt. Ashland Ski Area Expansion could remove up to 24 acres and 37 acres of late-successional habitat, respectively. While these projects will likely remove habitat suitable for fisher denning, resting, and foraging they are not expected to create barriers to fisher movement. The Ashland Forest Resiliency Project is designed to restore more fire resilient forests in the Ashland watershed by implementing several types of hazardous fuel treatments. Primarily through a reduction in canopy closure, approximately 1,000 acres of fisher denning, resting, and/or foraging habitat will be removed or degraded with the implementation of this project. Because fisher home range size is likely indicative of habitat quality, activities that remove or degrade habitat could impact fisher by increasing the size of or causing a shift in existing home ranges.

Cumulatively, reasonably foreseeable future actions will impact fisher by reducing the quality and/or quantity of available denning, resting, and foraging habitat and by fragmenting existing habitat. However, these effects are not expected to significantly impact the viability of the local fisher population in the analysis area because less than 9% of existing denning and resting habitat will be impacted, and denning and resting habitat will remain well distributed across the northern portion of the LSR. Additionally, foraging habitat will remain abundant and well distributed throughout the analysis area and no barriers to fisher movement are expected as a result of these actions. Because project activities are expected to have negligible impacts to fisher habitat and not affect habitat connectivity, these actions are not expected to measurably impact the viability of fisher in the Project Area. Therefore, project activities would not measurably contribute to loss of fisher population viability at larger scales regardless of other reasonably foreseeable future actions.

3.2.13 American Marten

The American marten *(Martes americana)* is listed as a USFS Region 5 Sensitive Species due to loss and fragmentation of habitat, and the fact that they are easily trapped.

3.2.13.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.13.2 Affected Environment

Numerous carnivore surveys have been conducted over the past decade within and immediately adjacent to the Project Area. These included 12 track plate and camera stations that were periodically monitored by the KNF on the Oak Knoll and Scott River Ranger Districts from 1992–1996 (USDA Forest Service n.d.(a)); 60 track plate stations monitored by the USFWS on the Oak Knoll and Scott River Ranger Districts in 2005 and 2006 (Yaeger pers. comm.);19 baited camera stations in the Collins-Baldy LSR in 2004 (Farber and Franklin 2005); and 21 baited camera stations in the Mt. Ashland LSR and adjacent private lands (Farber and Criss 2006). These combined survey efforts resulted in only a single marten detection in 2005 (Yaeger pers. comm.) approximately 28 miles southwest of the Project Area. It is not known if this animal is associated with a population within the Marble Mountain Wilderness or if it is a dispersing individual from the coastal population.

Within the Project Area, potential habitat for martens is restricted to the higher elevation, mature true fir stands.

3.2.13.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of marten habitat in the Project Area will significantly change in the near future. However, FFE modeling indicates that in the event of a fire, crown fire potential and expected tree mortality in true fir stands within the Project Area will increase over time. Thus, important habitat components such as large-diameter trees, snags, and DWD and complex structure near the forest floor would likely be removed.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Under Alternatives 2, 4, and 5, thinning and fuels treatments are proposed in approximately 25–35 acres of potential marten denning and resting habitat. Thinning and fuels treatments are not proposed in marten denning and resting habitat under the Preferred Alternative. Thinning designed to promote the development of late-successional habitat will not remove important structural components of marten habitat such as large-diameter trees, snags, and DWD, and 60% canopy cover will be retained in true fir stands. Under Alternatives 2 and 4, approximately 4 acres to be treated occur in a DFPZ. Thus, it is expected that important components of marten habitat such as large DWD and complex structure near the forest floor will be removed. Although prescriptions are designed to meet *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for DWD, underburning will likely remove other structural components of marten habitat near the forest floor. No temporary spur road or landing construction is proposed in marten habitat.

Indirect Effects

In the long term, thinning treatments are expected to benefit marten by increasing the amount and distribution of denning and resting habitat as well as provide complex structure near the forest floor which provides subnivean access to prey, cover from predators and thermoregulation (Buskirk and Ruggerio 1994; Buskirk and Powell 1994; Powell et al. 2003). FVS modeling indicates that 50 years post-thinning, stands would typically exhibiting the habitat characteristics needed for denning, resting, and subnivean access (see LSR Indirect Effects on p. 3-33). FFE modeling also indicates that thinning and subsequent fuels treatment will generally reduce crown fire potential and maintain vertical fuel structures conductive to surface fires and significantly reduce predicted stand mortality in the event of a fire start. These factors indicate that stands providing habitat for marten will be more resistant to large-scale fires.

Cumulative Effects

Because true fir was not a sought after species, the railroad logging era had little impact to marten habitat. Although the actual amount removed since that time is unknown, timber harvest has likely removed marten habitat from the north central (Section 30 of Township 40S; Range 1E) and north western (Section 30 of Township 40S; Range 1E) portions of the Project Area. Other planned projects or activities expected to occur on federal land within the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. These activities are not expected to impact marten habitat. Due to the limited impacts to marten habitat, the action alternatives will not significantly augment the cumulative impacts to marten.

3.2.14 Pallid Bat and Townsend's Big-eared Bat

Pallid bats *(Antrozous pallidus)* are listed as a USFS Region 5 Sensitive Species because of the increasing use of caves by humans. Pallid bats are very sensitive to disturbance at their maternity and hibernating roost sites. It is important that these sites remain undisturbed because these sites are essential for metabolic economy and juvenile growth (CDFG 1990).

Townsend's big-eared bats *(Plecotus townsendii)* are listed as a USFS Region 5 Sensitive Species due to a steep decline in numbers and high sensitivity to human disturbance at roost sites. Townsend's big-eared bats are extremely sensitive to disturbance at roost sites (Humphrey and Kuntz 1976) and may abandon a roost site following a single disturbance (CDFG 1990).

3.2.14.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.14.2 Affected Environment

Suitable roost sites for pallid bats in the form of large trees, snags, buildings, and bridges are scattered throughout the Project Area. Although surveys have not been conducted within the Project Area, pallid bats have been captured <10 miles away (USDA Forest Service 2005a). Because suitable roost sites are fairly common and due to verified presence adjacent to the Project Area, it is reasonable to conclude that pallid bats are present within the Project Area.

There are no caves or open mines within the Project Area. However, suitable roost sites for Townsend's big-eared bats in the form of large-diameter trees are scattered throughout the Project

Area and other structures including buildings and bridges are also present. Thus, it is reasonable to assume that Townsend's big-eared bats are present in the Project Area.

3.2.14.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of pallid and Townsend's big-eared bat habitat in the Project Area will significantly change in the near future. FVS modeling indicates that 50 years from present, stands will have more large trees per acre suitable for roosting but this habitat component will still not be abundant. FFE modeling indicates that fire intensity and resulting tree mortality will increase over time. Although fire may produce roost sites by creating tree hollows, high intensity fire has the potential to remove existing sites.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Thinning in DFPZs, fuels treatments, and temporary road construction may remove individual large trees or snags that may be used for roosting. By meeting the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and because the removal of large diameter trees would only occur under limited circumstances, impacts to roosting habitat are expected to be minimal. However, the action alternatives propose activities that would require heavy machinery and create noise significantly above ambient levels within and adjacent to potential roosting habitat. Because these species are sensitive to disturbance at roost sites, these actions would likely have an effect on roosting behavior if bats are present. Potential disturbance of roost sites is only possible during project implementation, thus these impacts are expected to be short-term.

Indirect Effects

Thinning is expected to have long-term benefits for pallid and Townsend's big-eared bats by promoting the development of large-diameter trees which may provide suitable roosting sites. Additionally, FFE modeling indicates that the proposed thinning and fuels treatments would change expected fire behavior over time, resulting in fires of less intensity, thus, reducing the potential that existing habitat will be removed.

Cumulative Effects

Past management activities in the Project Area has likely impacted pallid and Townsend's big-eared bats by removing potential roost sites. Reasonably foreseeable future actions in the Project Area include small scale timber harvest on private lands. These activities may remove individual large trees and snags and increase the potential to disturb roost sites, but due to the scale of these projects, they are not expected to be significant. Other federal projects planned in the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. While pre-commercial thinning will not remove habitat, this activity along with recreational activities have the potential to disturb roost sites.

3.2.15 Northwestern Pond Turtle

In the Pacific Northwest the distribution of western pond turtles (*Emys marmorata*) is disjunct but includes southern Oregon and northern California (CDFG 1988; Leonard et al. 1993). The northwestern pond turtle *(Emys marmorata marmorata)*, which is recognized as a subspecies of the western pond turtle (Stebbins 2003) is found only in northern California (Ashton et al. 1997). Western pond turtles are listed as a USFS Region 5 Sensitive Species and Management Indicator Species because of declining populations, population fragmentation, habitat alteration, water pollution, and illegal collection.

3.2.15.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.15.2 Affected Environment

Potential habitat for northwestern pond turtles is restricted to a 0.5 acre holding pond and its adjacent forest in the southern portion of the Project Area.

3.2.15.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance, particularly a flood event, it is unlikely that the amount of northwestern pond turtle habitat would change.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

The action alternatives will have no effect on aquatic northwestern pond turtle habitat. However, the approximately 12 acres of thinning and fuels treatments proposed within 600' of the holding pond, have the potential to injure or kill overwintering or nesting turtles.

Indirect Effects

By promoting the development of large-diameter trees and recruitment of large DWD, the action alternatives would likely increase the recruitment of potential basking sites into existing habitat.

Cumulative Effects

Reasonably foreseeable future actions expected to occur adjacent to the holding pond include grazing. This activity is not expected to impact northwestern pond turtles. Thus, the cumulative effects to northwest pond turtles are expected to be minimal.

3.2.16 Foothill Yellow-legged Frog

Foothill yellow-legged frogs *(Rana boylii)* are listed as a USFS Region 5 Sensitive Species because of declining populations. Many of the same reasons for decline listed for the western pond turtle also apply to this frog. There are no shallow, low-gradient waters suitable for yellow-legged frog breeding in the Project Area. Therefore, the action alternatives will have no effect on foothill yellow-legged frogs.

3.2.17 Cascade Frog

Cascade frogs *(Rana cascadae)* are listed as a USFS Region 5 Sensitive Species because of declining populations. It is also listed as a Management Indicator Species under the River/Stream Association. Many of the same reasons for decline listed for the western pond turtle also apply to this frog. Cascade frogs range from northern Washington to north-central California (Stebbins 2003) and have been confirmed to occur approximately 25 miles southwest of the Project Area (Welsh and Pope 2004).

3.2.17.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.17.2 Affected Environment

Suitable habitat for Cascades frogs within the Project Area consists of one 0.5-acre pond. This pond provides potential breeding and hibernating habitat. Streams within the Project Area are characterized by steep gradients and fast currents and do not provide breeding and hibernating habitat.

3.2.17.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of Cascade Frog habitat would change. FFE modeling indicates that surface fire intensity and resulting tree mortality will increase over time, thus, increasing the likelihood that shading of existing Cascaded frog habitat will be reduced.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Project Standards and Guidelines include a 150’ buffer around the holding pond in which only pre-commercial thinning may occur. Habitat or frogs are unlikely to be directly affected.

Indirect Effects

Thinning activities are not expected to affect the amount of shade over the holding pond. Although prescribed fires will not be set within this buffer, underburns may be allowed to back into this area. These types of underburns are not expected to have a significant impact on overstory trees and pond shading. Thinning and fuels treatments will not have any direct effects to the pond and thus will not impact Cascade Frog breeding or hibernating habitat. FFE modeling also indicates a change in fire behavior over time that would decrease the likelihood that shading of Cascade frog habitat would be impacted.

Cumulative Effects

The action alternatives will have no effect on Cascades frogs; therefore, there will be no cumulative effects from the proposed alternatives combined with other actions in the Project Area.

3.2.18 Blue-gray Taildropper and Tehama Chaparral

Blue-gray taildroppers *(Prophysaon coeruleum)* and Tehama chaparral *(Trilobopsis tehamana)* snails are listed as USFS Region 5 Sensitive Species due to a small number of known occurrences.

3.2.18.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.18.2 Affected Environment

In 1999 and 2000, about 100 randomly-selected, 10-acre plots were surveyed for terrestrial mollusks on the KNF. These surveys discovered eleven and eight occurrences on the Goosenest and Happy Camp Ranger Districts, respectively. Potential habitat for the blue-gray taildropper does exist within the Project Area. However, the likelihood that this species occurs in the Project Area is small for the following reasons: (1) potential habitat is patchy and not widely distributed; (2) the lack of hardwoods; (3) the predominantly xeric conditions; and (4) the lack of known sites. Pre-disturbance surveys for mollusks were conducted for the Beaver Creek and the Uptown projects, approximately 1–7 miles south and 2–7 miles southwest of the project, respectively. These surveys covered approximately 3,700 acres with no detections of blue-gray taildroppers (USDA Forest Service n.d.(b)).

The Tehama chaparral snails' range is very limited, currently only known from 11 sites in Northern California (8 sites in Siskiyou County, 1 in Tehama County, 1 in Shasta County, and 1 in Butte County). Known locations on the KNF include areas along the Shasta River on the Scott River Ranger District.

Within the Project Area suitable habitat for the Tehama chaparral snail is limited to isolated patches of shaded talus. Due to the predominately xeric conditions and the lack of known sites adjacent to the Project Area, pre-disturbance surveys for mollusks were conducted for the Beaver Creek and the Uptown projects approximately 1–7 miles south and 2–7 miles southwest of the project, respectively with no detections of Tehama chaparral snails (USDA Forest Service n.d.(b)). The likelihood that the species is present within the Project Area is small.

3.2.18.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of blue-gray taildropper or Tehama chaparral habitat would change in the near future. However, FFE modeling indicates several general patterns regarding fire behavior and fire-induced tree mortality over time including (1) a constant or increasing crown fire potential under both moderate and severe weather conditions, (2) an increase in surface fire intensity under both moderate and severe weather conditions, and (3) either a constantly high or increasing level of BA mortality. Because this species is associated with moist sites containing high levels of shade, these patterns could potentially result in a significant loss of blue-gray taildropper habitat.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning and fuels treatments are proposed in suitable blue-gray taildropper and Tehama chaparral snail habitat. However, Project Conservation Measures for treatments within and adjacent to known sites ensure that >60% canopy cover, large DWD, and sufficient forest floor litter is retained within and adjacent to known occurrences. Thus, impacts to specific habitat components and microclimates of stands containing blue-gray taildropper or Tehama chaparral snail habitat is expected to be insignificant.

Approximately 0.07–0.25 miles of temporary road construction is proposed in potential habitat for blue-gray taildroppers. Construction of temporary roads is not proposed within or adjacent to Tehama chaparral habitat. If surveys indicate that habitat is occupied, road segments will be dropped or realigned to avoid direct impacts to habitat. Thus, temporary road construction will have no impact to habitat for these species. One landing is proposed in potential blue-gray taildropper habitat under Alternatives 2, 4, and the Preferred Alternative. If surveys indicate that this habitat is occupied, this landing will be relocated.

Indirect Effects

The dispersal capability of these species is expected to be limited, thus, construction of temporary roads has the potential to restrict movements and isolate populations. However, because all temporary spur roads will be decommissioned, these impacts are only expected to occur in the short term until favorable habitat conditions become reestablished on decommissioned roads.

FFE modeling indicates a change in fire behavior over time following thinning and fuels treatments that would decrease the likelihood of fire having significant impacts to blue-gray taildropper and Tehama chaparral habitat. Over time, thinning is expected to have beneficial effects on these species by promoting the development of structurally complex, late-successional forests that can sustain stable microclimates.

Cumulative Effects

Because reasonably foreseeable future actions in the Project Area are not expected to impact riparian habitat, appreciably alter the microclimate within talus slopes or closed canopy moist forests, and do not include road construction, these actions are not expected to adversely effect blue-gray taildroppers or Tehama chaparral snails.

3.2.19 Siskiyou Mountains Salamander

The Project Area is outside of the currently known range of the Siskiyou Mountains salamander but is within the survey and manage survey zone (Clayton et al. 1999). It is also listed as a Region 5 Sensitive Species. The closest known Siskiyou Mountains salamander site is approximately 7.5 miles northwest of the Project Area on the north side of the Siskiyou Crest.

Habitat for Siskiyou Mountains salamanders in the Project Area is limited to isolated pockets of shaded talus. Surveys for this species adjacent to the Project Area failed to detect the presence of Siskiyou Mountains salamander. Pre-disturbance surveys for Siskiyou Mountains salamander were conducted on approximately 100 acres for the Beaver Creek and the Uptown projects approximately 1–7 miles south and 2–7 miles southwest of the project, respectively (USDA Forest Service n.d.(b)). The likelihood that Siskiyou Mountains salamander are present in the Project Area is low. However, because surveys for the beaver Creek and Uptown projects were not designed to determine the absence of the species (Clayton et al. 1999), and habitat exists, its presence in the Project Area cannot be ruled out.

Project conservation measures and Standards and Guidelines from the LRMP implemented for Survey and Manage Species (6–17 as updated) ensure that the action alternatives will either meet habitat retention standards or have no impact to existing habitat, and will not disturb normal behavior of Siskiyou Mountains salamanders. Thus, the action alternatives will have no effect on this species.

3.2.20 Siskiyou Sideband

The Siskiyou sideband *(Monadenia chaceana)* is a land snail that ranges from southwestern Oregon (Douglas County) to west-central California. It is listed as a Survey and Manage Species in the NWFP. Habitat alteration (which affects the microclimate at occupied sites or dispersal routes) is considered to be the major threat to the species.

3.2.20.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.20.2 Affected Environment

Habitat for the Siskiyou sideband includes late-successional forest and rocky slopes or talus, particularly the lower third of talus slopes where environmental conditions are more stable (Weasma 1999). When environmental conditions are favorable, this species will also utilize adjacent forested habitat and may be found under litter on the forest floor (ibid.).

Within the Project Area, suitable habitat for the Siskiyou sideband is limited to isolated patches. Due to the limited amount of talus habitat, the predominately xeric conditions, and the lack of known sites adjacent to the Project Area the likelihood that the species is present within the Project Area is small. Pre-disturbance surveys for mollusks were conducted for the Beaver Creek and the Uptown projects approximately 1–7 miles south and 2–7 miles southwest of the project, respectively, with no occurrences of Siskiyou sidebands (USDA Forest Service n.d.(b)).

3.2.20.3 Environmental Consequences

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of Siskiyou sideband habitat would change in the near future. However, FFE modeling indicates general patterns of fire behavior over time include an increase in surface fire intensity and constantly high or increasing tree mortality. These patterns have the potential to impact Siskiyou sideband habitat by reducing shading of talus and altering microclimates within occupied stands.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together except where specifically stated otherwise.

Direct Effects

Thinning and fuels treatments are proposed in potential Siskiyou sideband habitat. However, project conservation measures ensure that >60% canopy closure, consisting of the larger mature trees, large DWD, and sufficient forest floor litter is retained within and adjacent to known sites. Additionally, no heavy equipment will be used on talus slopes. Thus, impacts to specific habitat components and microclimates of stands containing Siskiyou sideband snail habitat are expected to be minimal.

Approximately 0.07–0.3 miles of temporary road construction is proposed in potential Siskiyou sideband habitat. Under Alternatives 2, 4, and the Preferred Alternative, one landing is also proposed in potential Siskiyou sideband habitat. If surveys indicate that these habitats are occupied, road segments will be dropped or realigned and the landing will be relocated to avoid direct impacts to snails and occupied habitat.

Indirect Effect

Because this species has specific habitat requirements and are slow to disperse, construction of temporary roads has the potential to restrict movements and isolate Siskiyou sideband populations. However, because all temporary spur roads will be decommissioned, these impacts are only expected to occur in the short term until favorable habitat conditions become reestablished on decommissioned roads.

FFE modeling also indicates a change in fire behavior over time following thinning and fuels treatments that would reduce the likelihood of fire having significant impacts to microclimates within late-successional stands and stands within and adjacent to talus slopes.

Cumulative Effects

Because reasonably foreseeable future actions in the Project Area are not expected to significantly alter the microclimate within late-successional stands or talus slopes, and do not include road construction, these actions are not expected to impact Siskiyou sideband snails.

3.2.21 Oregon Red Tree Vole

The project is located in an area outside of the known range of the Oregon red vole *(Arborimus longicaudus)*. There are no anticipated impacts to this species with any of the alternatives.

3.2.22 River/Stream MIS Association

The individual effects for the River/Stream Species Management Indicator Species Association are discussed collectively at the end of the four species descriptions. Species included in this association are tailed frogs, American dipper, northern water shrew, long-tailed vole, and Cascade frog.

3.2.22.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.22.2 Affected Environment

Tailed frog

Potential habitat for tailed frogs within the Project Area occurs in narrow fast moving headwaters of perennial streams (an estimated 35.8 miles). General stream surveys conducted in Grouse Creek in 2005 failed to detect tailed frogs (B. Thomas pers. comm.). Additionally, the Project Area receives approximately 30” of rain annually in its lower elevations and approximately 75” of precipitation at their highest elevations in the form of snow. Surveys and prevailing climate suggest that the likelihood of tailed frogs being present within the Project Area is low. Sedimentation and increased stream temperatures are considered to be the major threat to the species.

American Dipper

Streams containing suitable habitat for American dippers occurs throughout the Project Area. Potential habitat exists along 43.5 miles of Beaver, Deer, Cow, Grouse, Long John, and West Branch Long John Creeks. Events or actions that increase stream temperature, increase silting, or increase or decrease flows, pose the major threats to the species.

Northern Water Shrew

Streams containing suitable habitat for northern water shrews occur throughout the Project Area.

Other potential habitat includes a 0.5-acre holding pond. Events or actions that impact riparian habitat and/or instream habitat components pose the major threat to this species.

Long-tailed Vole

Suitable habitat for long-tailed voles is scattered throughout the Project Area but is most predominate in the upper tributaries of Long John and Grouse Creeks. Events or actions that impact riparian habitat and/or the herbaceous understory of forests pose the major threat to this species.

Cascade Frogs

Please refer to Section 3.2.17 for a description of Cascade frog.

3.2.22.3 Environmental Consequences

Effects of Alternative 1-No Action

In the absence of large-scale natural disturbance it is unlikely that the amount or quality of habitat for river/stream associated MIS would change in the near future. However, FFE modeling indicates general patterns of fire behavior over time, which include an increase in surface fire intensity and constantly high or increasing tree mortality. Following high intensity fire, surface erosion is expected to occur and the potential for landslides increases. These processes would contribute sediment to streams potentially impacting turbidity and stream substrate. High intensity fire also has the potential to remove riparian vegetation, which can increase stream temperatures, and other structures such as downed logs.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

LRMP Standards and Guidelines for thinning and fuels reduction in Riparian Reserves (MA10) are designed to ensure that Riparian Reserves are intact and functioning post-treatment and that existing stream shading is not reduced. Additionally, only trees <9” DBH will be felled within 170’ of a stream. Although the turbidity in some streams may elevate slightly during initial storm events following treatments in Riparian Reserves, these impacts are not expected to be significant. The retention of functioning Riparian Reserve buffers around streams will also minimize the probability of any mobilized sediment originating from stands outside of Riparian Reserves from reaching the stream channel.

Under Alternatives 2 and 4, approximately 300 feet of temporary road T410 is proposed within a Riparian Reserve. Temporary road construction will remove approximately 0.25 acre of riparian habitat. This level of riparian habitat modification is expected to have a negligible impact on stream water quality.

Road-related activities, including water drafting and road decommissioning, have the potential to directly kill or injure tailed frogs or impact habitat for the other river/stream-associated species. Culvert removal during road decommissioning would be subject to the same BMPs as temporary road construction in Riparian Reserves. Thus, this activity will have minimal impacts to in-stream habitat components and stream quality. Road decommissioning could remove up to 1 acre of riparian habitat. There are five potential water drafting sites identified within the Project Area. All drafting equipment will be screened and water drafting will not reduce naturally-occurring flow by more than 10%. Thus, direct impacts to tailed frogs and impacts to stream water quality are expected to be negligible.

Indirect Effects

In the long term, thinning and fuel reduction treatments are expected to benefit river/stream associated species by reducing the likelihood of stand-replacing fire which can remove riparian vegetation and lead to increases in stream sedimentation. Over time, the increase in large diameter trees will also result in an increase of large DWD within stream habitats.

Cumulative Effects

Within the Project Area, there are approximately 550 acres of private land which contain approximately 3.5 miles of potential river/stream associated species habitat. Reasonably foreseeable future actions on these private lands include small-scale timber harvest around 1.5 miles of stream that provide potential habitat. However, these activities only include partial cuts, which will limit erosion and increases in stream sedimentation. Although the exact amount is unknown, private land timber harvest will likely remove some streamside habitat components, degrading habitat quality. Other federal projects or activities expected to occur within the Project Area include pre-commercial thinning, grazing, and dispersed recreation. On-going pre-commercial thinning in plantations is not expected to affect the function of Riparian Reserve buffers. The current level of grazing in the Project Area is believed to result in only minor erosion impacts and recreation is not expected to impact the river/stream species associates. Thus, cumulative effects to river/stream associated species and their habitats are expected to be minimal.

3.2.23 Marsh/Lake/Pond MIS Association

The marsh/lake/pond MIS association consists of northern red-legged frog *(Rana aurora)* and northwestern pond turtle. The northwestern pond turtle is discussed in Section 3.2.15 and the northern red-legged from is discussed below.

3.2.23.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.23.2 Affected Environment

Northern Red-legged Frog

Habitat for northern red-legged frogs is limited to a 0.5-acre holding pond. Streams within the Project Area are characterized by steep gradients and fast currents and do not provide suitable habitat.

Events or actions that impact riparian habitat or emergent vegetation pose the major threat to this species.

3.2.23.3 Environmental Consequences

The environmental consequences to northern red-legged frog are discussed below. See Section 3.2.15 for a discussion of northwestern pond turtle.

Northern Red-legged Frog

Effects of Alternative 1 – No action

In the absence of large-scale natural disturbance it is unlikely that the amount of northern red-legged frog habitat would change. FFE modeling indicates that surface fire intensity and resulting tree mortality will increase over time. Following a stand replacing fire, stream flows would likely increase following storms, thus, increasing the likelihood of a flood event. The No Action Alternative does little to protect the long term sustainability of the limited northern red-legged frog habitat in the Project Area.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Thinning and fuels treatments will not have any direct effects to the existing pond and thus will not impact breeding habitat. However, thinning and fuels treatments that occur adjacent to the pond have the potential to kill or injure individuals. The likelihood of frogs being killed or injured during thinning operations is expected to be low, as approximately only 2 acres are proposed to be thinned within 150' of the pond. Although no fires are proposed to be ignited within the Riparian Reserve surrounding the pond, underburns will be allowed to back into this reserve. These underburns are designed to imitate low intensity fire, thus impacts to red-legged frogs are expected to be minimal.

Indirect Effects

Thinning activities are not expected to affect the amount of shade over the holding pond. Although prescribed fires will not be set within this buffer, underburns may be allowed to back into this area. These types of underburns are not expected to have a significant impact on overstory trees and pond shading. Thinning and fuels treatments will not have any direct effects to the pond and thus will not impact northern red-legged frog breeding or hibernating habitat. FFE modeling also indicates a change in fire behavior over time that would decrease the likelihood that shading of Cascade frog habitat would be impacted.

Cumulative Effects

Privately owned lands exist approximately 500' south of the pond but no reasonably foreseeable future actions are planned. Reasonably foreseeable future actions on other private lands occurring >0.5 mile from the pond and are not expected to have any impacts to the pond environment. Other reasonably federal actions or activities in the Project Area include pre-commercial thinning in plantations and grazing. These actions are not expected to impact northern red-legged frog habitat.

3.2.24 Snag MIS Association

The Snag MIS Association consists of pileated woodpecker, hairy woodpecker, red-breasted sapsucker, Vaux's swift, black-backed woodpecker, and white-headed woodpecker. The effects for the snag-associated species are discussed collectively at the end of the species descriptions. There will be no effects to downy woodpecker as its habitat does not occur within the Project Area.

3.2.24.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.24.2 Affected Environment

Pileated woodpecker

Large, contiguous blocks of habitat suitable for pileated woodpeckers is limited to the northeast portion of the Project Area. Habitat in the remainder of the Project Area consists of small or isolated patches. Events or actions that remove large-diameter trees and/or snags pose the major threat to this species.

Hairy Woodpecker

Large, contiguous blocks of habitat suitable for hairy woodpeckers is limited to the northeast portion of the Project Area. Habitat in the remainder of the Project Area consists of small or isolated patches. Events and actions that fragment forested habitat pose the major threats to this species.

Red-breasted sapsucker

Habitat suitable for nesting and foraging for red-breasted sapsuckers is widely distributed through the Project Area. Events or actions that remove snags pose the major threat to this species.

Vaux's Swift

Large, contiguous blocks of old-growth forest are limited to the northeast portion of the Project Area. The remainder of the Project Area contains only small or isolated patches of habitat suitable for Vaux's swifts. Events or actions that remove large-diameter trees and snags suitable for nesting and roosting pose the major threats to this species.

Black-backed Woodpecker

Potential habitat for black-backed woodpeckers is widely distributed across the Project Area but is dependent upon the presence of woodboring beetles. Actions that eliminate fire or salvage dead and dying trees pose the greatest threats to this species.

White-headed woodpecker

Potential habitat for white-headed woodpeckers is limited to the mature mixed conifer and true fir stands in the northeastern and north central portions of the project. Within the Project Area, mature pine is limited to small (usually less than ten trees), isolated patches not expected to support white-headed woodpeckers. Actions or events that remove large-diameter trees and snags suitable for nesting and roosting pose the greatest threat to the species.

Downy woodpecker

Habitat for downy woodpeckers *(Picoides pubescens)* does not occur within the Project Area.

3.2.24.3 Environmental Consequences

Effects of Alternative 1- No Action

Under the No Action Alternative, mature stands exhibiting large-diameter trees, snags, and DWD would be slow in developing. In the event of a fire start within the Project Area, FFE modeling indicates several general patterns regarding fire behavior and fire-induced tree mortality over time including (1) a constant or increasing crown fire potential under both moderate and severe weather conditions, (2) an increase in surface fire intensity under both moderate and severe weather conditions, and (3) either a constantly high or increasing level of BA mortality. These patterns may have some benefit to snag-associated species by creating nesting and roosting structure and by increasing foraging opportunities in the short term. However, uncharacteristic wildfire has the potential to remove existing habitat components such as large snags and DWD, to impact recruitment of these components over the long term, and to significantly reduce or create large gaps in the canopy. The actual extent of these effects, whether beneficial or adverse, is dependent upon fire intensity and size. FFE modeling suggests that fire behavior over time would likely result in long term impacts that would exceed short term benefits for the snag-associated species.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Thinning designed to promote the development of late-successional habitat will not remove important structural components of snag-associated species such as large-diameter trees, snags, and DWD. Thinning prescriptions are also designed to leave a minimum of 15% of each stand unthinned as well as a minimum canopy closure of 60% in existing NSO nesting, roosting, or foraging habitat which typically provides quality habitat for snag-associated species. Thus, canopy cover, an

important element of pileated woodpecker and Vaux's swift habitat, is not expected to be significantly impacted within potential habitat for these species. Thinning to create DFPZs and construction of temporary roads may impact snag-associated species habitat by removing large-diameter trees (>20"), snags, and DWD. The removal of large-diameter trees would only occur under limited circumstances, the removal of large snags or groups of snags will be limited to situations where they pose a hazard to operations, and where consistent with DFPZ objectives large-diameter DWD will be retained. Therefore, impacts to the distribution and abundance of these habitat components are expected to be minimal. Fuel reduction treatments also have the potential to remove snags and DWD. Prescriptions are designed to imitate low intensity fire and are designed to retain *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for these components. Thus, fuels treatments are not expected to have a significant impact to important structural components of snag-associated species habitat.

Indirect Effects

Over time, thinning and fuels treatments are expected to have significant benefits to snag-associated species by increasing the amount and distribution of important habitat components. FVS modeling indicates that 50 years post-treatment trees >30" DBH would increase from one to three per acre to 14 to 15 per acre, thus significantly increasing the large tree component and the recruitment of large diameter snags and DWD. FFE modeling also indicates that thinning and subsequent fuels treatment will generally reduce crown fire potential, promoting a surface fire type and will likely reduce predicted stand mortality in the event of a fire start. These factors indicate that stands will be more resistant to large-scale fires but will still burn with sufficient intensity to create snags and small openings within forested habitat. Thus, these fire behavior patterns have the potential to create important structural components for snag-associated species without significantly reducing existing components.

Cumulative Effects

Past effects to snag-associated species habitat in the Project Area are similar to those described for NSOs. Although the amount of habitat on private lands within the Project Area is unknown, large trees and snags do not appear to be abundant. Reasonably foreseeable future actions in the Project Area include small-scale timber harvest on private lands. These activities may remove individual large trees and snags, but due to the scale of these projects, impacts to these components are not expected to be significant. Other federal projects or activities expected to occur within Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. These activities are not expected to impact snag-associated species habitat.

3.2.25 Grassland/Shrub-Steppe Species Association

There is no habitat for pronghorn (*Antilocarpa Americana*), montane vole (*Microtus montanus*), loggerhead shrike (*Lanius ludovicianus*), Swainson's hawk (*Buteo swainsoni*), sage thrasher (*Oreoscoptes montanus*), or burrowing owls (*Athene cunicularia*) in the Project Area.

3.2.26 Mature Ponderosa Pine Species Association

There is no mature pine habitat as used by white-headed woodpeckers (*Picoides albolarvatus*), flammulated owls (*Otus flammeolus*), or pinyon jay (*Gymnorhinus cyanocephalius*) in the Project Area.

3.2.27 Game

Effects are discussed collectively for all game species at the end of the species descriptions starting on p. 3-78.

3.2.27.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.27.2 Affected Environment

Black Bear

In Oregon and California black bears *(Ursus americanus)* typically inhabit mixed deciduous-coniferous forests with dense understories but will forage in a variety of habitats within a forest mosaic (CDFG 1990; Csuti et al. 1997). Black bears have a seasonal variation in diet, consuming grass and forbs in early spring, insects and fruits in summer, and acorns, nuts, and fruits in the fall. Over-wintering dens include downed logs, caves, and holes dug in the ground but are most commonly constructed at the base of a hollow tree (Maser 1998).

Elk

Elk *(Cervus elaphus)* are primarily found in semi-open mature, confer, deciduous or mixed forests habitats (CDFG 1990; Csuti et al. 1997). Mature stands with dense brush understory are used for escape and thermal cover. Primarily grazers, preferring a diet of grasses and forbs, they will browse

on trees and other woody vegetation in winter (Csuti et al. 1997). In winter elk move to lower elevations to avoid deep snow (Maser 1998).

Mule Deer

Mule deer (*Odocoileus hemionus*) typically inhabit open forests and brushy areas at the edges of forests and chaparral thickets but may also be found in old-growth coniferous forests (Csuti et al. 1997; Maser 1998). They graze and browse eating a variety of forbs, grasses, lichens, and tips of woody vegetation. Brushy area and tree thickets are important for cover and thermoregulation (CDFG 1990). In winter, mule deer move downslope to areas receiving less annual snowfall (ibid.).

Wild Turkey

In Oregon, wild turkeys *(Meleagris gallapova)* inhabit open woodlands and riparian areas and are most often found in oak or mixed oak-conifer woodlands with grassy openings (Csuti et al. 1997). They eat a variety of foods including seeds, nuts, grains, buds, green leaves, and occasionally invertebrates (Eaton 1992). Turkeys nest on the ground at the base of vegetation (ibid.). Roosting sites typically occur in mature multi-layered stands that provide protection from prevailing winds (Mackey 1984; Lutz and Crawford 1987).

3.2.27.3 Environmental Consequences

Effects of Alternative 1 – No Action

In the absence of large-scale natural disturbance it is unlikely that the amount or quality of habitat for game species would change significantly in the near future. In the event of a fire start in the Project Area, FFE modeling indicates general patterns of fire behavior over time that include an increase in surface fire intensity and constantly high or increasing tree mortality. These types of fire could potentially improve game habitat by reducing conifer encroachment in naturally occurring meadows, reducing density in overstocked stands, and stimulating the development of understory vegetation. Potential adverse effects would include a short term loss of escape and thermal cover and a loss of denning, roosting, and nesting habitat. The actual extent of these effects, whether beneficial or adverse, is dependent upon fire intensity and size.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative – Action Alternatives

The action alternatives would all have similar effects and will be discussed together.

Direct Effects

Thinning designed to promote the development of late-successional habitat will not remove important structural components of game denning or resting habitat such as large-diameter trees, snags, and DWD. Thinning to create DFPZs, fuels treatments, and temporary road construction may impact game habitat by removing large-diameter snags, DWD, and shrub cover. However, because *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) recommendations for snags and DWD will be retained where stand conditions permit and less than 1 acre of riparian habitat will be removed, these impacts are expected to be insignificant at the scale of the Project Area.

Indirect Effects

Thinning and underburning would likely improve habitat quality for big game by reducing stem density in overstocked stands and promoting understory development.

Numerous studies have indicated that roads can have a negative effect on game habitat use patterns, movements, and survival (Rost and Bailey 1979; Holbrook and Vaughn 1985; Witmer and deCalesta 1985; Brody and Pelton 1989; Rowland et al. 2000). Although research on the response of game to road closure is limited, it does suggest that closing roads can effectively minimize these impacts (Basile and Lonner 1979; Cole et al. 1997). Therefore, impacts to game species are only expected over the short term until the temporary spur roads are decommissioned.

Cumulative Effects

Reasonably foreseeable future actions in the Project Area include small-scale timber harvest on private lands. These activities include partial cuts which may open stands and improve habitat for some game species. Other federal projects or activities expected to occur within the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. Thinning of plantations may benefit game by reducing the density of stands and by promoting the development of mature stands over time. Grazing and recreation may negatively impact game by reducing forage and increasing the likelihood of human disturbance. Thus, the cumulative effects of this project combined with other reasonably foreseeable future actions are expected to be insignificant.

3.2.28 Avian Communities (including Resident and Neotropical Migrants)

3.2.28.1 Analysis Methods

For analysis methods, please refer to Section 3.2.1.2 on p. 3-23.

3.2.28.2 Affected Environment

In the early 1990s, the southern portion of the Mt. Ashland LSR was systematically surveyed for songbirds. These surveys detected over 70 avian species including 31 neotropical migratory species. In the *Mt. Ashland Late-successional Reserve Assessment* (USDA Forest Service 1996a), these species were assigned to one of the following four species assemblages: cavity nesting; forest related; riparian; and early successional and shrub. Of these assemblages, the forest related assemblage contained the greatest number of species (39), while the cavity nesting and riparian assemblages had 16 and 14 species, respectively. The early-successional and shrub assemblage had the least number of species (5).

Because the 1990s survey routes covered significant portions of the Project Area, surveys conducted outside of the Project Area covered similar habitat types to those found within the Project Area, and the habitat requirements for most of the *Mt. Ashland Late-successional Reserve Assessment* (ibid.) assemblages are well distributed within the Project Area, it is reasonable to assume that results of the early 1990s surveys in the southern portion of the Mt. Ashland LSR represent a realistic approximation of the avian community within the Project Area. There has not been any notable change in vegetation (habitat) since 1990 (no timber harvest, no wildfire), thus the 1990s surveys are relevant, and appropriate for this analysis.

3.2.28.3 Environmental Consequences

Effects of Alternative 1-No Action

Under the No Action Alternative, change in forest structure and composition at the landscape scale would be slow in developing. Thus, no significant changes in avian communities would be expected. In the event of a fire start within the Project Area, FFE modeling indicates several general patterns regarding fire behavior and fire-induced tree mortality over time including (1) a constant or increasing crown fire potential under both moderate and severe weather conditions, (2) an increase

in surface fire intensity under both moderate and severe weather conditions, and (3) either a constantly high or increasing level of BA mortality.

Several studies have shown that some avian species respond favorably to wildfire events while the abundance of other species declines (Hutto 1995; Kotliar et al. 2002; Smucker et al. 2005). Even following high-severity fire, Smucker et al. (2005) found that an approximately equal number of forest birds increased in abundance as decreased. Thus, under the expected fire behavior described above, it is likely that there will be a shift in avian communities but not necessarily a decrease in forest bird abundance.

Effects of Alternatives 2, 4, 5, and the Preferred Alternative

The action alternatives would all have similar effects and will be discussed together.

Direct effects

By removing live conifers, thinning will remove potential nesting habitat for some species. However, thinning prescriptions have been designed to leave a minimum of 15% of each stand unthinned, ensuring that habitat for species that require shaded forest stands will be well distributed throughout the Project Area. Additionally, thinning prescriptions are designed to retain and promote the development of existing hardwoods and retain important structural components such as large diameter trees and snags. Therefore, thinning prescriptions will help to maintain a variety of habitat conditions which may effectively reduce the impact to some species and promote avian diversity across the landscape (Hagar et al. 1996; Hagar et al. 2004; Alexander et al. 2007).

Fuels reduction treatments such as underburning and mastication and temporary road and landing construction have the potential to remove habitat and/or impact active nests for some avian species. Prescriptions for underburns are designed to mimic low intensity fire and meet project Standards and Guidelines for DWD. Additionally, most underburns will likely occur before or after the nesting season for most of the avian species found in the Project Area. Thus, underburns are not expected to appreciably impact habitat components such as shrubs, grasses, and DWD, or damage active nests. Mastication is proposed on approximately 8%–10% of the Project Area. Because topography within stands is highly variable and masticators will be restricted to slopes ≤ 35%, the actual number of acres and percent of the Project Area treated by mastication will likely be less than that presented above. Temporary road and landing construction are expected to impact between 29 and 65 acres or < 1% of habitat within the Project Area. Thus, these activities are not expected to significantly alter the distribution of important habitat components across the landscape or directly impact a significant number of nests.

Indirect Effects

Thinning will also focus on early- and mid-successional stands that typically lack well developed understories. Over time, the thinned early- and mid-successional stands will likely support a richer avian community as their understories become more developed and the stands become more structurally complex. Thus, thinning will likely have little negative impact to existing diversity and abundance of avian species and will likely benefit the avian community over time.

Cumulative Effects

Reasonably foreseeable future actions in the action area include small-scale timber harvest on private lands. Although these actions will remove habitat components for some avian species, the expected level of timber harvest would not appreciably reduce habitat quality. Other federal projects or activities expected to occur within the Project Area include ongoing pre-commercial thinning in existing plantations, grazing, and dispersed recreation. Pre-commercial thinning in plantations will likely increase species diversity over time while grazing will continue to impact riparian habitats and the grass/forb community. Cumulatively, these actions are not anticipated to have significant negative impacts to the avian community but may result in a shift of community structure over time.

3.3 Fire and Fuels

3.3.1 Analysis Methods

The fire and fuels analysis area is the Beaver Creek 5th field watershed; which includes the Grouse Creek, Long John Creek, Hungry Creek, Bumblebee, Buckhorn, Lower West Fork, Upper West Fork, and Jaynes Canyon subwatersheds.

Stand composition and structure will influence fire behavior, which in turns affects the post-fire stand conditions. This analysis focuses on factors that influence fire behavior, that determine how resilient a stand may be to the effects of a fire, and which influence suppression effectiveness. The FFE-FVS was used to model changes in horizontal and vertical fuel conditions, fire behavior, and fire effects. The FFE-FVS model is an extension to FVS (refer to the Vegetation Section) that integrates FVS with elements from existing models of fire behavior and fire effects. Information from FVS (tree and harvest data) is used in the FFE-FVS to predict changes in stand and fuel characteristics over time and the behavior and effects of fire.

Descriptions of fuel loading and fire behavior fuel models found in the Project Area are based on fuels transect data and ocular estimates made during field visits. It is important to note that fuels and fire models are to some degree inherently inaccurate and therefore only able to approximate natural processes. They are most useful for trend analyses. Although the FFE-FVS models are developed from actual stand data, stand attributes are averaged before predictive models are created. Therefore, existing within-stand variability is not captured in the modeling process. Additionally, the FVS model applies a silvicultural treatment uniformly across a stand and cannot model more complex treatments such as the variable density thinning prescriptions and habitat retention standards proposed in this project.

The modeled results are not intended to be absolute values but display relative trends for defined categories. The analysis of potential fire behavior and fire effects is based on the interpretation of the FFE-FVS results. FFE-FVS is a non-spatial model that does not display the effects of disrupting the continuity of fuels, so all fuel treatments are assumed to result in a continuous fuel bed after implementation. As a result, the potential fire behavior and effects are anticipated to be lower than the model predictions. The Fire and Fuels Assessment (Wright 2007) provides a full explanation of the FFE-FVS analysis process, modeling methodologies, affected environment for fire and fuels, and environmental consequences. It is incorporated by reference and available in the project file. The supporting science for this model is available in Reinhardt and Crookston (2003).

3.3.1.1 Analysis Factors

Fuels, topography, and weather influence how a fire will burn. The fuel is the only component which can be influenced through management. For modeling purposes topography is maintained constant (50% slope) and weather is defined by very dry, or severe conditions (90th percentile weather) and dry, or moderate conditions (50th percentile weather).

Fire Weather

The percentile weather is defined by the percent of days during fire season that a given set of conditions is likely to occur, or be exceeded, based of historic weather observations. Historically 10% of the days during fire season are at, or above the 90th percentile parameters. Similarly, 50% of the days during fire season are at, or above the 50th percentile parameters. Historic weather observations from the Collins Baldy remote automated weather station (RAWS) were used to determine the 90th and 50th percentile weather parameters. For this analysis the fine fuel moistures were increased by 1% to account for differences between the RAWS site and the Project Area. The parameters used are displayed in Table 3-6.

Table 3-6 Weather Parameters

Moderate Conditions (50th Percentile Weather)		Severe Conditions (90th Percentile Weather)	
1 hour fuel moisture	9%	1 hour fuel moisture	6%
10 hour fuel moisture	10%	10 hour fuel moisture	7%
100 hour fuel moisture	13%	100 hour fuel moisture	9%
1000 hour fuel moisture	25%	1000 hour fuel moisture	10%
Air temperature	73º F	Air temperature	85º F
20 ft wind speed	5 mph	20 ft wind speed	10 mph

Surface Fire Intensity

The intensity of the flaming front affects tree survival. Although different species have different survival rates, larger trees with thicker bark are less susceptible than small trees. In general, as intensity increases, survivability decreases for any given species of a given size. For trees that are not killed outright by the flaming front, the surface fire intensity affects the amount of crown scorch that occurs. This will reduce the amount of live crown available for photosynthesis and will increase the crown base height.

Surface fire intensity also influences crown fire potential. For a crown fire to occur there must be sufficient heat generated to move the flames into the crowns. The amount of heat necessary to move a fire into the crowns also depends upon the stand structure. A stand of trees with live crowns close

to the ground requires less heat for fire to move into the crowns than a stand of trees with greater distance between the ground and the live crowns.

Ladder fuels

Ladder fuels consist of small trees and brush in the understory which enable a fire to move from the surface to the crowns. The presence of small trees in the understory affects the canopy base height, which is a measure of the height from the ground to the base of the tree crown. Canopy base height is defined as the lowest point from the ground where there are sufficient quantities of live foliage to enable a fire to move from the surface into the crown. The method of calculating canopy base height is described by Scott and Reinhardt (2001).

Canopy Bulk Density

The compactness of the tree crowns influences crown fire spread once a surface fire is able to move into the crowns. Canopy bulk density is an estimate of crown weight for a given volume (either kg/m^3 or lb/ft^3) that is used as a measure of the density of tree crowns within a stand. The methods for calculating canopy bulk density are also based on Scott and Reinhardt (2001). At higher densities a fire can be sustained and move through the crowns (defined as active crown fire). At lower densities, although a fire may be able to move into the crowns, it cannot be sustained and would result in single tree or group torching also referred to as a passive crown fire. Changes in canopy bulk density can also be used as a measure of change in stand structure.

Species Composition and Size

Fire affects trees differently depending on the species. Some species are relatively resistant to wildfires and will survive under a variety of burning conditions, while other species may be killed readily by low intensity burns. Size is also a factor. Smaller trees are generally more susceptible to fire and may be killed under conditions that would not kill larger trees of the same species.

Measures of Suppression Effectiveness

The *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999) identified the desired fire behavior within LSRs as flame lengths of less than 4’ and rates of spread of less than 20 chains per hour. Flame lengths less than 4’ allow for direct attack at the head and flanks of a fire with hand tools. Hand constructed line should be able to hold a fire. Rates of spread less than 20 chains per hour are within production capabilities of Initial Action resources. For example, a five person engine crew (a standard configuration on the KNF) is capable of constructing 20 chains of fire line per hour during an initial attack in the fuel types found within the LSR. The analysis

includes a discussion of how the indicators (flame length, fire type, rate of spread) influence fire behavior as measured in the ability of fire crews to suppress a wildfire.

Flame length, which directly correlates with fireline intensity, affects the choice of suppression tactics. Table 3-7 outlines how flame length influences fire suppression actions as interpreted in Appendix B of the Fireline Handbook (NWCG 1998).

Table 3-7 Suppression Interpretations

Flame Length (ft.)	Fireline Intensity (BTUs/Ft/Sec)	Interpretations
0–4	0–100	Fires can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the fire.
4–8	100–500	Fires are too intense for direct attack on the head by persons using hand tools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
8–11	500–1,000	Fires may present serious control problems, including torching, crowning and spotting.
11 and greater	1,000 and greater	Crowning, spotting, and major runs are common. Control efforts at the head of the fire are ineffective.

Rate of spread is influenced by the type of fuel that is burning, the topography, and the wind speed. Spread rates can be calculated for different areas of the fire. For this analysis the rate of spread is calculated for the head of the fire, which is the direction of primary spread. FFE-FVS does not calculate spread rates. Potential rate of spread as modeled in BehavePlus v3 is used to evaluate relative changes in suppression effectiveness. BehavePlus is a Windows ® application to predict wildland fire behavior for fire management purposes. It is designed for use by trained, professional wildland fire managers and planners who are familiar with fuels, weather, topography, wildfire situations, and associated concepts and terminology. The Behave program has been used to model fire behavior since 1984. Rothermel's surface fire spread model (1972) is a fundamental component of BehavePlus. The 13 standard fire behavior fuel models as described by Anderson (1982) are used as inputs, along with historic weather parameters defined in Table 3-6.

Rate of spread was evaluated under both moderate and severe conditions: for five fire behavior fuel models, slope steepness ranging from 20%–60%, and a range of canopy conditions. Fire behavior Fuel Models 8, 9, 10, and 11 were used to model rate of spread for the current condition. After thinning, prior to surface fuels treatment, many proposed treatment stands would also be best represented by a slash fuel model. Fuel Model 13 was selected, as it represents the heaviest fuel

conditions. This fuel model would display worst case for fire behavior. Table 3-8 provides a brief description of the stand fuel models used in this analysis.

The modeled range of canopy cover used for untreated stands is 50%–75%, which represents the range of current and projected conditions with the No Action Alternative. The modeled range of canopy cover used for thinned stands ranges from 25%–50%, and represents the possible range of conditions immediately after thinning without factoring in the within-stand variability, variable density treatments, and habitat retention areas.

Table 3-8 Fire Behavior Fuel Models (Anderson 1982)

Fuel Model Description	Example
Fire Behavior Model 8 Closed canopy stands of short-needle conifers or hardwoods that have leafed out. Fire spreads through a compact litter layer, consisting mainly of needles, leaves and occasional twigs. Little undergrowth is present in the stand. Generally slow burning fires with low flame lengths, although occasional heavy fuel concentrations may occur causing the fire to flare up. Only under severe weather conditions, involving high temperatures, low humidity, and high winds do the fuels pose a fire	
Fire Behavior Fuel Model 9 Closed stands of long-needled pines and hardwoods. Fires run through the surface litter faster than Model 8 and have longer flame length. Concentrations of dead and down woody material will contribute to possible torching of trees, spotting and crowning.	
Fire Behavior Fuel Model 10 Any forest type may be considered if heavy down material is present. The dead and down fuels include greater quantities of 3” and larger limb wood. Fires burn in the surface and ground fuels with greater intensity than other timber fuel models. Crowning, spotting and torching are more frequent in this fuel type, leading to potential fire control difficulties.	
Fire Behavior Fuel Model 11 A slash fuel model which can also represent stands with higher loads of fuel from wind damage and areas of high mortality. The arrangement of the fuel, shading from the overstory, or age of fine fuels can contribute to limiting fire potential. Fires are fairly active in the areas of concentrated fuels and understory vegetation intermixed with the dead fuels.	
Fire Behavior Fuel Model 13 Fire is generally carried by a continuous slash layer. Large quantities of material larger than 3” are present. Situations were the slash still has red needles, but total amount of fuels is less, can be represented because a fire to quickly become more intense and burn more rapidly. Fires spread quickly through the fine fuels and intensity builds more slowly as large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated	

Currently much of the area would be characterized as Fuel Models 8 and 10. There are also concentrated areas of recent mortality that would be best represented by the slash Fuel Model 11. After thinning, prior to surface fuels treatment, many proposed treatment stands would also be best represented by a slash fuel model.

The effects of fuels treatment options were evaluated based on modeling results. It is anticipated that fuels treatment will occur within three to five years after the silviculture treatments are completed. In the modeling, all fuels treatments were assumed to occur by 2009.

The FFE-FVS simulations were analyzed at four points in time to allow comparison of effects over time. The analysis of current conditions provides a baseline for these comparisons. Each action alternative was evaluated post-mechanical treatment prior to completing the surface fuels treatment; post-surface fuels treatment; at years 20 and 40.

3.3.1.2 Evaluation Criteria

The changes in surface fire intensity (heat released in a fire); ladder fuel condition; canopy density; species composition and size; and suppression effectiveness are defined by the following evaluation criteria:

- ***Surface Flame Length*** - indicator of surface fire intensity.
- ***Fire Type*** – indicator of whether a fire is likely to stay on the surface or move through the crowns. Fire type has the following four categories:

  1. ***Surface Fire*** – This type of fire remains on the forest floor because the combination of fire intensity and ladder fuels is not sufficient to move it into the tree crowns. It is the least intense form of fire, generally burning cooler than other types of fire. It is the easiest to control, and firefighters have a greater chance of putting it out during initial attack (the first suppression action taken by way of ground or air).

  2. ***Passive Crown Fire*** – This type of fire remains on the surface but exhibits some individual tree or group torching (burning from the bottom to the top of a tree). Fire intensity is still fairly low.

  3. ***Active Crown Fire*** – This type of fire is more intense than the other types. The fire is not restricted to the surface because the combination of surface fire intensity, ladder fuels, and canopy density allow fire to move into, and spread through, tree crowns.

  4. ***Conditional Crown Fire*** – Canopies are dense enough to carry fire with the projected wind speeds, but the surface fire intensities and ladder fuels do not allow movement into the crowns. Crown fires may move into the stand from outside, but cannot be initiated from within the stand under the projected wind speeds.

- ***Potential Mortality*** – (wildfire-induced mortality) indicator of how a stand with a given species composition and structure would be expected to respond under defined burning conditions.

- ***Rate of Spread*** – indicator of the speed at which a fire grows, generally referred to in chains per hour. A chain equals 66 feet.

3.3.2 Affected Environment

3.3.2.1 Climate

The area has a combination of maritime and continental weather influences. Winters are cool and moist, with most precipitation falling as snow at the higher elevations, lasting until early summer in protected locations. Summers can be hot and dry with intermittent thunderstorms, which may be wet or dry, accompanied by lightning. The Collins Baldy RAWS located across the Klamath River shows an average of 35" of precipitation per year. Wildfires generally occur from June through October. Fires burn hottest when fuels are dry and relative humidity is low, conditions that normally occur during August and September.

3.3.2.2 Fire Environment

Historic Fire Regime

A fire regime is a generalized description of the role fire plays in an ecosystem. Agee (1993) defines a fire regime as the combination of fire frequency, predictability, intensity, seasonality, and extent characteristic of fire in an ecosystem. There are multiple systems used to define the fire regime. The system used in this analysis is a combination of fire frequency and fire severity devised by the USDA Forest Service, Interior Agencies, and the Nature Conservancy (Hann et al. 2003). "Natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation" (ibid.).

Within the Project Area, the lower elevation mixed conifer stands are classified as Fire Regime I, defined by a fire frequency of 0–35 years and low (surface fires most common) to mixed severity (<75% of the dominant overstory vegetation replaced).

The higher elevation red fir dominated stands are classified as Fire Regime III, defined by a fire frequency of 35–100 plus years and mixed severity (<75% of the dominant overstory vegetation replaced). Several authors agree that red fir dominated forests such as in the upper reaches of the Mt. Ashland LSR Project Area fall into a mixed severity fire regime (Agee 1993, 1998; Skinner and

Chang 1996). A review of pertinent literature reveals that red fir forests are highly variable when it comes to fire return intervals. Many studies indicate a wide variation about the mean, ranging as much as from 5 to 157 years between fires (Agee 1998). Fire intensity and effects on stand structure are also highly variable in these stands. Patch sizes and tree ages will show great diversity due to the complexities of the relationship between fire occurrence, fire intensity, and stand structure at any point in time.

Fire Regime Condition Class

The Fire Regime Condition Class (FRCC) is a classification of the amount of departure from the natural fire regime (Hann et al. 2003). The classification is based on a relative measure describing degree of departure from the historical fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g., insect and disease related mortality, grazing, and drought). Three classes are used to define the degree of departure:

- Condition Class 1 – Landscape is within the natural (historic) range of variability of vegetation characteristics, fuel composition, fire frequency, severity, and pattern. Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion. Composition and structure of vegetation and fuels are similar to natural (historic) regime.
- Condition Class 2 – There is a moderate departure from the natural (historic) fire regime. Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered.
- Condition Class 3 – There is a high degree of departure from natural (historic) fire regime. Composition and structure of vegetation and fuels are highly altered.

This analysis includes an assessment of the degree of departure for both historic fire return interval (FRCC [FRI]) and vegetative structure (FRCC [VS]). A detailed discussion of the methodology for determining FRCC can be found in the “Fire Regime Condition Class Report” (Creasy et al. 2006).

The fire regime characterizations, as defined by Hann et al. (2003), are consistent with the published fire history studies in the Klamath region. Fires were common in the Klamath and Siskiyou mountains. Lightning was the primary ignition source. A fire history study on Thompson Ridge (roughly 35 air miles to the west) determined that, prior to European settlement, the median fire return interval (the number of years between two successive fire events in a given area) was 14.5 years and the annual area burned was roughly 350 hectares (Taylor and Skinner 1998). Similar results were found in the Hayfork study area roughly 75 air miles to the south (Taylor and Skinner 2003). Fires burned with variable severity across the landscape, killing many trees in some stands and few in others. Fire severity patterns were influenced by aspect and slope position. Fires were

generally less severe on lower slopes, particularly north and east aspects. Fires occurring on the upper slopes tended to have more high severity burned area, particularly on south and west aspects (Taylor and Skinner 1998, 2003). The cumulative effect of the variation in fire severity across the slopes suggests that forested stands with late-successional characteristics (e.g., multi-layered canopy, high density of large diameter trees, snags, and downed logs) were more commonly found at lower slope positions as well as on north and east facing slopes. The upper slopes and middle slopes on south and west facing aspects were more likely to have a pattern of scattered older trees, and remnant patches of older trees mixed in with larger areas of younger trees where fires had previously burned at intensities severe enough to kill many of the trees in the stand (Taylor and Skinner 1998).

Fire History

The Forest has kept fire occurrence records since 1922. These records were analyzed for the period of 1922–2004 to determine fire frequency, cause of ignition, and fire size. An area that included historical fires within and adjacent to the Project Area was selected as the best representation of threats to the Project Area. This area is approximately 205,500 acres and includes the Beaver Creek, Little Applegate, and Cottonwood Creek 5th field watersheds. Within the Beaver and Cottonwood Creek watersheds, 558 and 199 fires, respectively, were recorded during the 82-year period. Lightning was the identified cause of 80% (Beaver) and 50% (Cottonwood) of those fires; most fires were effectively suppressed at <10 acres. Little Applegate has a shorter fire history record with 172 fires recorded over a 36 year period; the majority of fires in this watershed were human caused.

Several large fires have occurred in the Beaver Creek watershed. Since 1922, approximately 17,500 acres have burned, mostly in the lower half of the watershed. Past fire suppression has been successful at excluding wildland fire from much of the Project Area. Data from fire occurrence records in all three watersheds indicates that lightning is the most likely cause of ignition within the Beaver Creek watershed and human caused ignitions are more of a threat from adjacent watersheds. In addition, data indicates that there is an increased likelihood of larger fires occurring during the latter part of the season (August through October) when conditions are drier (Wright 2007).

Fire Risk

Fire risk is the statistical probability of a fire start occurring over a ten-year period for a given 1,000-acre area. The primary source of ignitions within the area is lightning; however, human-caused fires are always possible. The calculated fire risk takes all ignition sources into account. The fire history data were analyzed and stratified into three levels of fire risk:

- ***High Risk*** – At least one fire expected to occur per decade for every thousand acres in the area being analyzed.

- ***Moderate Risk*** – Between 0.5 and 0.99 fires expected to occur per decade for every 1,000 acres in the area being analyzed.
- ***Low Risk*** – Less than 0.5 fires expected to occur per decade for every 1,000 acres in the area being analyzed.

The 558 fires occurring over 82 years in an area of 69,710 acres yields a calculated risk of 0.98, which is at the high end of Moderate Risk. It is expected that approximately one fire (0.98) will occur for every 1,000 acres being analyzed during the next decade. Refer to the fire and fuels assessment (Wright 2007) for a complete discussion of risk calculations.

Fire Behavior

Fire behavior is influenced by a variety of factors. Understory structure, overstory structure, and average tree size can influence fire behavior. Ladder fuels (small trees and brush that allow fire to move from the ground into the tree crowns) increase the potential for a surface fire to move from the ground into the tree crowns. Conversely, the understory can develop to a point that fire behavior is reduced. As trees grow and the bottom of the crowns becomes higher, the opportunity for fire to reach the crowns is reduced.

Changing stand conditions cause changes in fuel characteristics, potential fire behavior, and fire effects. Litter, branch fall, and dead trees add fuel to the forest floor, while decomposition breaks fuels down. The amount and arrangement of surface fuels continually changes over time. Fuel loading increases when fuel accumulation exceeds the decay rate. As fuel loading increases, the likelihood of more intense surface fire (fire that burns on the forest floor) increases, meaning ground fires will burn hotter and kill more vegetation.

Changes in overstory structure will also influence fire behavior. Dense canopies may contribute to crown fire spread but also reduce the amount of wind reaching the surface and may contribute to an increase in fine fuel moisture due to the shaded conditions. Conversely, open stands may not allow fire spread between crowns, but could result in higher wind speeds at the surface and increased fine fuel moisture. Finally, as trees get larger, the probability of wildfire-induced mortality decreases. Stands that develop a greater proportion of larger trees will be less susceptible to mortality from fire. Regenerating stands are susceptible to high fire mortality due to the higher proportion of small diameter trees.

Fuels

Fuel transect data were collected from representative stands in 2004. Surface fuels within the Project Area vary from open areas with low amounts of combustible material to areas with concentrations of heavy dead and down fuel loadings in stands that are severely impacted by tree mortality.

Management concerns focus on fine fuels, horizontally-oriented coarse fuels, and vertical fuels:

- **Fine fuels** are the smaller fuels which are <3" in diameter and are the easiest to ignite. Fine fuels generally control surface fire rates of spread and are represented by 13 fire behavior fuel models established by Rothermel in 1972, and documented by Albini in 1976, for use in surface fire spread models. These standard fire behavior fuel models have been in use since that time, with a guide developed by Anderson (1982) commonly used for reference. The stands targeted for treatment vary but can be generally described as standard Fire Behavior Models 8, 9, 10, 11, 12, and 13. Fuel Model 8 represents closed-canopy stands with compact litter layers and only occasional concentrations of heavier fuels. Fuel Model 9 represents closed-canopy pine-dominated stands. The litter layer is less compact, resulting in greater flame lengths and rates of spread than Fuel Model 8. Fuel Model 10 is typical of mature timber stands with moderate amounts of dead and down material. Fuel Models 11, 12, and 13 are more representative of slash fuels, with greater loadings of fine fuels than other models, which can increase spread rates and flame lengths. Fuel Models 8 and 10 dominate the Project Area. Areas of wind damage or concentrated mortality are best represented by a Slash Fuel model 11.

- **Horizontally-oriented coarse fuels** consist of pole- and sawlog-sized fuels falling to the ground as mortality increases. The standard fire behavior fuel models do not explicitly capture the contribution of larger fuels (>3" diameter) to fire behavior and effects. Areas where densely grown trees are competing for resources, larger diameter material is being recruited into the fuel beds as stand mortality occurs and dead trees fall to the forest floor. These fuels do not contribute to the fire spread models; however when they fall to the ground they raise the fuel bed height, increasing flame heights and fire residence time. As these fuels shatter and decay they become fine fuels, adding to spread rates. Resistance to control by suppression forces is also increased as large fuels accumulate on the forest floor, adding time and difficulty to fireline construction by suppression forces. Pockets of this type of fuel exist throughout the Project Area.

- **Vertical fuels** are standing vegetation, either live or dead, which can serve as links for ground fire to move into overstory canopies, initiating crown fires, which can be the most destructive and difficult to suppress. Many stands are overly dense, with low canopy base heights, making them highly susceptible to crown fire initiation. Standing dead trees (snags) are good receptors for embers. Embers from burning snags are also more easily carried by winds ahead of a fire, increasing spotting potential and adding to fire spread.

Vegetation Characteristics

Vegetation characteristics have been classified by primary vegetation type and distribution of structural classes within each vegetation type. The vegetation classification is a step in the process of defining the FRCC. Review, validation and refinement of the historic fire regimes and reference conditions developed nationally has been undertaken by the Pacific Southwest Region ecology program. In the Project Area, the classification was completed by the Province Ecologist using a process that is being applied consistently across the Pacific Southwest Region (Creasy et al. 2006). Potential Natural Vegetation maps, existing vegetation maps, gradient modeling, lithology, elevation, and climate grids were all used to characterize the vegetation types (referred to as biophysical settings by FRCC). The Vegetation Dynamics Development Tool (VDDT) was used to

generate predictions of historic distributions of structural classes at the landscape scale, given the fire regime associated with the vegetation types that are present. The current landscape conditions are then contrasted with reference conditions to determine the degree of departure from historic (reference) conditions.

The Project Area consists primarily of mixed conifer forest. The lower elevation mixed conifer stands are classified as Fire Regime I, defined by a fire frequency of 0–35 years and low-severity (surface fires most common) to mixed-severity (<75% of the dominant overstory vegetation replaced.)

Mixed conifer stands consist of three vegetation types. The dominant vegetation type is white fir mixed conifer (61% of the landscape), which occurs within areas where white fir is capable of becoming a dominant component within a stand. This vegetation type is found at higher elevations of the mixed conifer zone and lower on the slope on north and east aspects. The actual species composition within this vegetation type is influenced by fire frequency. More frequent fires result in a greater proportion of ponderosa pine, sugar pine, and Douglas-fir. In areas where fire occurs less frequently, white fir can become established and develop to sufficient size to withstand low-intensity fire. The second mixed conifer vegetation type is ponderosa pine mixed conifer (4% of the landscape). This vegetation type is found at lower elevations, particularly on south and west aspects. Jeffrey pine montane chaparral is located in areas of serpentine parent material (2% of the landscape).

The upper reaches of the Project Area consist primarily of red fir/white fir forests (29% of the landscape). This vegetation type occurs at higher elevations, where fires occur with less frequency. The higher elevation red fir-dominated stands are classified as Fire Regime III, defined by a fire frequency of 35–100 plus years and mixed severity (<75% of the dominant overstory vegetation replaced). Wet mountain meadows, also located at the higher elevations, account for another 2% of the landscape. Other vegetation types, including California grasslands, chaparral, and red fir/western white pine, comprise the remaining 2% of the landscape.

This analysis will focus on the mixed conifer and red fir/white fir vegetation types, as they dominate the landscape and are also the vegetation types where the majority of the treatments are proposed. Refer to the Mt. Ashland LSR Silviculture Report for a more detailed discussion of the vegetation condition.

As previously stated, Fire Regime Condition Class describes the degree of departure for vegetation, fire frequency, and fire severity. For this analysis only the vegetation and fire frequency departure is described. While it may be presumed that a high degree of departure in vegetative composition and

structure would translate to a departure in fire severity, there is not sufficient information relative to severity reference conditions to establish the degree of departure for fire severity.

Fire Return Interval Departure – FRCC (FRI)

Current fire return intervals exceed historic averages; approximately 89% of the Project Area has not experienced a wildfire since 1910. Approximately 74% of the Project Area is characterized as severely departed (Condition Class III), and approximately 22% is characterized as moderately departed (Condition Class II) as defined by the FRCC (FRI) measure.

Vegetative Structure – FRCC (VS)

The mixed conifer zone, which is Fire Regime I, has missed several fire return intervals. From a fire frequency standpoint [FRCC (FRI)], much of the Project Area is in Condition Class 3 (severely departed). The higher elevation red fir/white fire, Fire Regime III, is in Condition Class 2 (moderately departed) based on fire historic frequency.

The degree of departure for vegetation composition and structure [FRCCvs] is not as pronounced, with 55% of the Project Area characterized as Condition Class 2; 28% characterized as Condition Class 3; and the remaining 17% as Condition Class 1.

Condition Class is calculated at the 7th field watershed level. There are distinct differences between the 7th field watersheds. The analysis shows that Long John watershed is primarily Condition Class 3 in the lower elevation mixed conifer stands. The upper elevation true fir zone is primarily a mix of Condition Class 1 and 2 stands. The mixed conifer zone in the Grouse watershed is primarily Condition Class 2. The true fir zone is also a mix of Condition Class 1 and 2, but is skewed to a higher proportion of Condition Class 2.

The amount and distribution of structural classes influences the Vegetative Condition Classes. The reference conditions are based on modeling assumptions of the fire severity at the landscape scale and its effect on the vegetation. Seral stage (structure class) distribution is defined by the reference condition modeler in VDDT based on the fire regime associated with each vegetation type. The general definitions for structure classes are:

A: post-fire, often shrub/forbs but includes sapling trees
B: mid-development, closed canopy (trees 5”–20” DBH and >40% canopy cover)
C: mid-development, open canopy (trees 5”–20” DBH and <40% canopy cover)
D: late-development, open canopy (trees >20” DBH and <40% canopy cover)
E: late-development, closed canopy (trees >20” DBH and >40% canopy cover)

The late development stands have a component of larger trees (20” DBH or larger) that were apparent during the typing of stand structure. Within the Project Area, although a component of larger trees is present; many of the stands characterized as “late development” are dominated by mid-development stand structure (i.e., the majority of the trees in the stand are <20” DBH) as determined by field verification of vegetation typing.

The following graphs display the structural classes for the major vegetation types. Each graph displays the current acres, reference acres, and departure acres. The Reference Condition acres have a 15% error bar denoted on each column. This is done to acknowledge the probable error associated with these acres which have been derived from Region 5 or LANDFIRE Reference Condition models developed in VDDT.

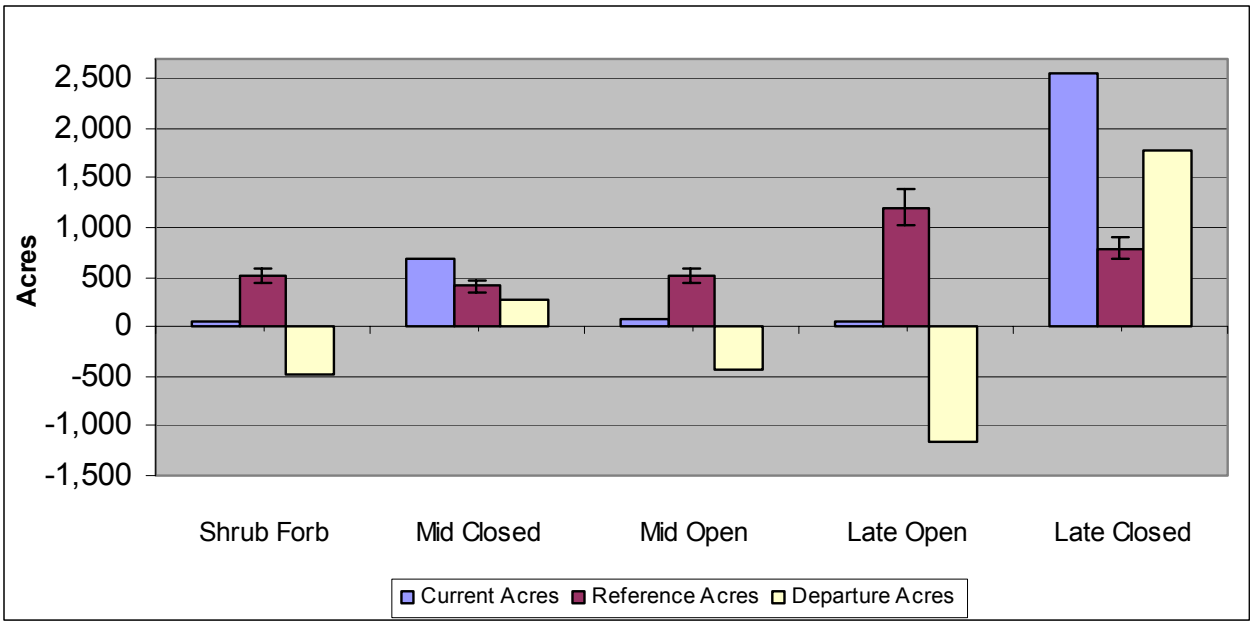

Figure 3-5 Long John 7th field watershed, white fir/mixed conifer structure classes

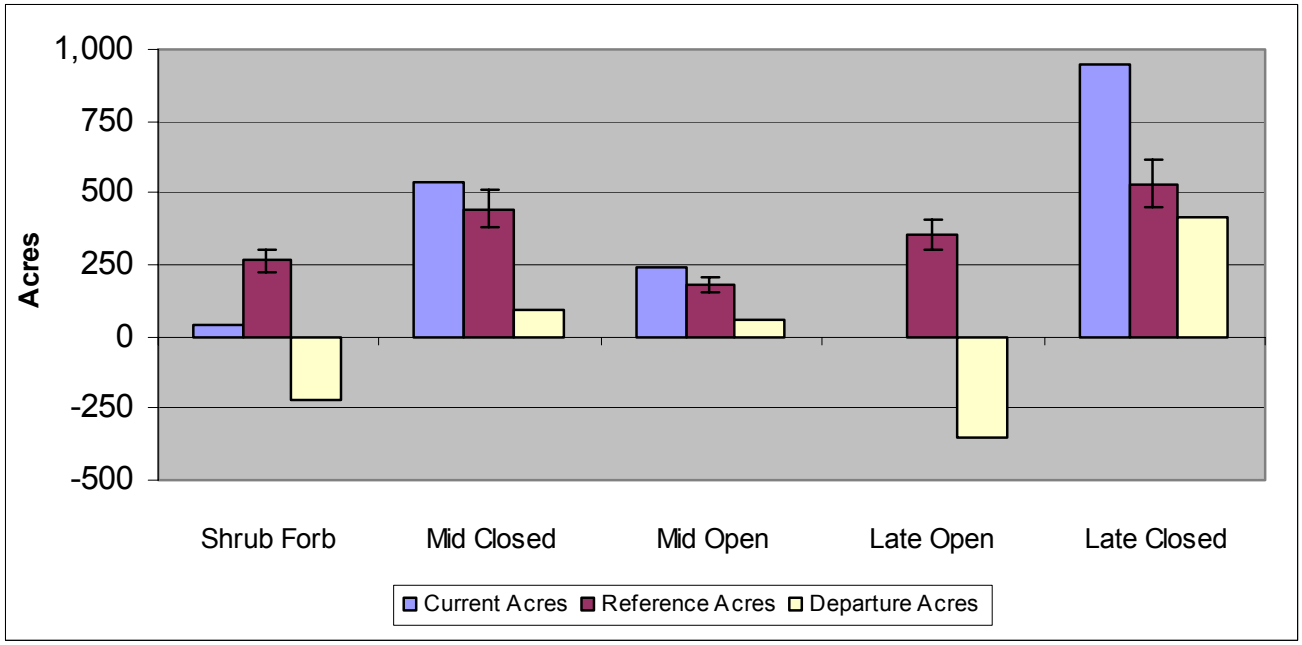

Figure 3-6 Long John 7th field watershed, red fir/white fir structure classes

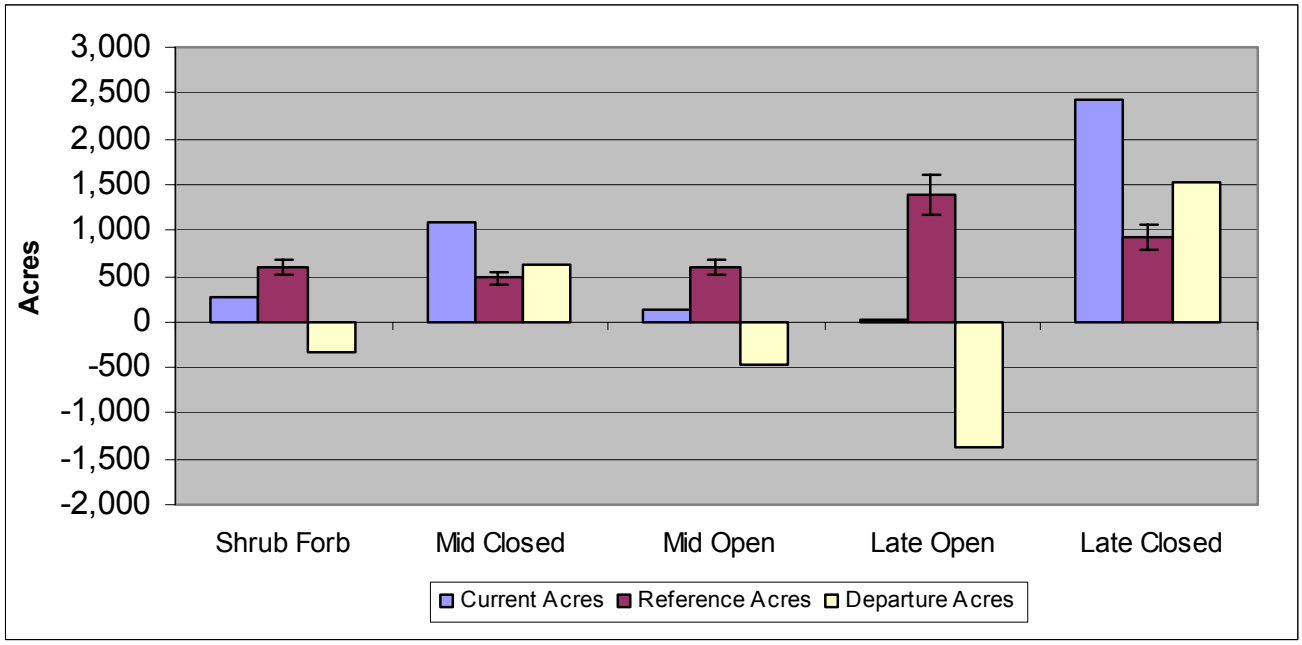

Figure 3-7 Beaver-Grouse 7th field watershed, white fir/mixed conifer structure classes

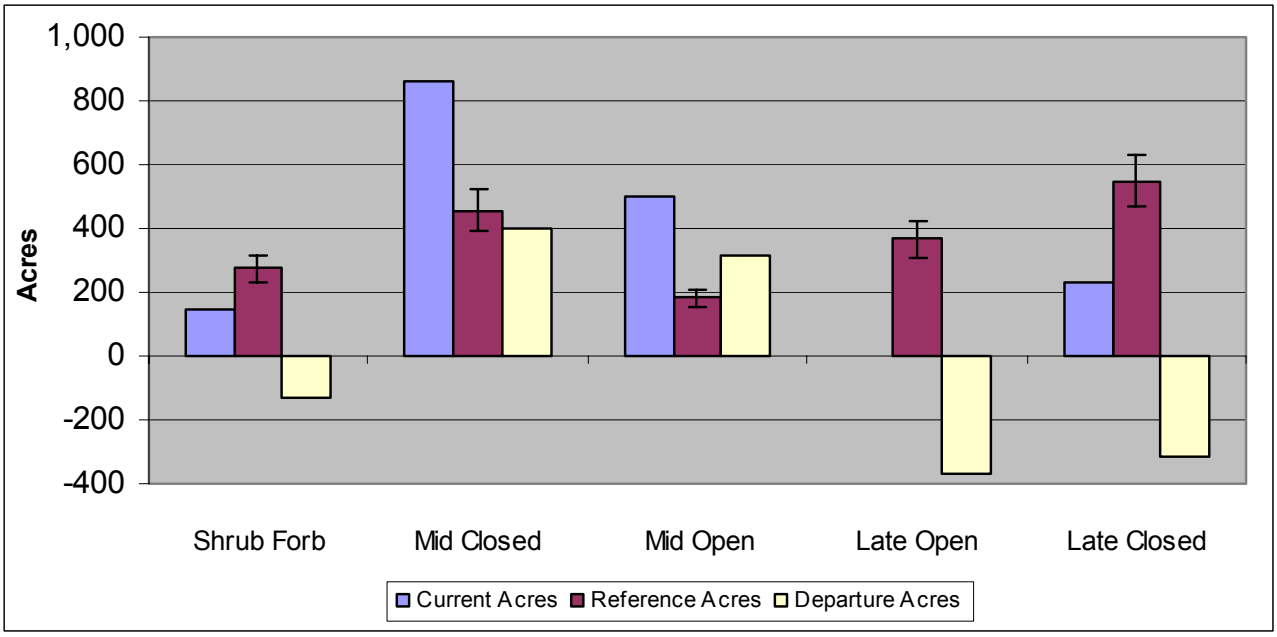

Figure 3-8 Beaver/Grouse 7th field watershed, red fir/white fir structure classes

The FRCC analysis indicates the Project Area lacks late-development open stand structure and, to a lesser degree, shrub-forbs vegetation. The FRCC analysis also displays an abundance of mid and late-development closed stand structure. Field verification indicates that much of the vegetation typed as late-development-closed stands, while containing a component of trees greater than 20" dbh, is predominantly comprised of trees less than 20" dbh and lacks the structural complexity to be characterized as late successional habitat. Refer to the Mt. Ashland LSR Silviculture Report (Varak 2007) for a more detailed discussion of the current condition of the vegetation. The report is available in the project file.

Treatments can be designed to reduce surface, ladder, and canopy fuels to an established threshold, which would result in acceptable fire behavior and post-fire stand conditions in relatively short time frames if necessary.

Addressing changes in species composition and tree size is more problematic. Many of the stands proposed for treatment in the Mt. Ashland LSR project contain large numbers of small diameter trees. Although treatments can be designed to increase average stand diameter over time, they must account for the current stand conditions. Stands dominated by small trees may require time to reach a size that will readily survive a wildfire. Finally, tree health also influences opportunities. While tree size is a factor of wildfire survivability, tree health also influences survival. A larger tree in an already weakened condition may not survive any better than a smaller vigorous tree. Findings in burned white fir by van Mantgem et al. (2003) indicate the frequency of trees killed by fire is at least partially dependent on the pre-fire stand conditions. They found that including pre-fire growth rates, along with the severity of fire-caused damage, improved post-fire mortality predictions. They

concluded that if tree growth is reduced by factors such as climatic change, increased forest density, or other stresses, there will likely be an increase in fire severity (number of trees killed), even when there is no change in fire intensity.

3.3.3 Environmental Consequences

For this analysis, treatment stands that focus on development of late-successional forest habitat were evaluated separately from DFPZ stands. The mixed conifer stands were grouped by watershed and aspect, the red fir/white fir stands were grouped, and each DFPZ was addressed separately.

Habitat Restoration Treatment Stands

Currently the mixed conifer stands on the north and east aspects of Long John Creek are susceptible to the effects of a wildfire under both moderate and severe conditions. The stands consist of large numbers of smaller trees and have low canopy base heights. Model results indicate that flame lengths exceed the capabilities of a crew with hand tools to directly attack a fire (direct attack capabilities). Under both moderate and severe conditions, fire will readily move into the crowns, with passive crown fire behavior, and there would be greater than 90% tree mortality within the fire perimeter.

The mixed conifer stands on the north and east aspects of Grouse Creek consist of fewer numbers of small trees and have higher canopy base heights. The differences in stand structure between the two sub-watersheds would result in subtle differences in fire behavior. However, modeled fireline intensities are similar and flame lengths are expected to exceed direct attack capabilities. In Grouse Creek, modeling indicates that dense stands would support an active crown fire under severe burning conditions, but would remain on the surface under moderate burning conditions. Similarly, mortality is projected to be near 100% under severe conditions, but is projected to be <25% under moderate burning conditions.

The sampled stands on the south and west aspects of Long John Creek and Grouse Creek are currently more resilient to stand-replacing fire when compared with the stands on north and east aspects. There is no projected difference in fire behavior between the modeled stands in either sub-watershed. Although a substantial component of smaller trees exists in these stands, the combination of lower levels of surface fuels and slightly higher canopy base height indicate a greater resilience. It would require higher wind speeds to move a fire into the tree crowns. Fewer trees would die given the same burning conditions described above for north and east aspects. Initially, fireline intensities are within the desired <4’ flame length for both moderate and severe burning conditions. Initially, fire is not expected to move into the crowns under the defined burning conditions and mortality levels remain low.

In true fir stands within the Project Area, modeling indicates desired flames lengths of 4' under moderate burning conditions, and flame lengths exceeding 4' under severe burning conditions. A fire is projected to remain on the surface, and tree mortality is projected to remain at <25%, under both moderate and severe conditions.

Defensible Fuel Profile Zone Treatment Stands

The composition and structure of the stands in the DFPZ varies. As a result, the projected fire behavior also varies. The Cow Creek, Doe Peak, and Four Corners are dominated by mixed conifer stands. The modeled flame lengths are near direct attack capabilities under severe conditions. Under moderate conditions the flame lengths remain at 4' or less. A fire is projected to remain on the surface under both moderate and severe conditions. The stand mortality for the Cow Creek and Four Corners DFPZ is projected to be <20% under moderate and severe burning conditions. While the fire behavior is similar in the Doe Peak DFPZ, the mortality is projected to be near 25% due to the higher component of small diameter trees.

Table 3-9 displays the projected flame lengths, type of fire, and mortality for all stands in their current condition.

Table 3-9 Project Flame Lengths, Fire Type and Mortality

Stand Category		Current Conditions					
		90th Percentile Conditions			50th Percentile Conditions		
Watershed		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	6'	P	99%	5'	P	93%
	Grouse	6'	A	100%	5'	S	24%
South and West Aspects	Long John	4'	S	23%	3'	S	20%
	Grouse	4'	S	23%	3'	S	20%
True Fir Stands							
All Aspects		5'	S	21%	4'	S	20%
DFPZs							
Cow Creek		5'	S	17%	4'	S	16%
Doe Peak		4'	S	27%	3'	S	25%
Four Corners		3'	S	17%	2'	S	17%
Siskiyou Gap		4'	P	45%	3'	S	16%
Siskiyou Peak		5'	A	100%	4'	S	27%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

For the north and east aspect mixed conifer stands, the fire behavior modeled in the FFE-FVS simulations is best represented by Fuel Models 10 and 11. The stands on the south and west aspect are best represented by Fuel Model 10, with portions of the stands represented by Fuel Models 8 and 12. The true fir stands are best represented by Fuel Models 10 and 11. The stands within the DFPZs

are best represented by Fuel Models 8 and 10, with portions of the stands represented by a Fuel Model 11. The rates of spread projected for each of these fuel models are displayed in Table 3-10 and Table 3-11.

Table 3-10 Rate of Spread for Severe Conditions (90th Percentile Parameters)

Fuel Model	Rate of Spread in Chains per Hour					
	20% Slope 75% Cover	20% Slope 50% Cover	40% Slope 75% Cover	40% Slope 50% Cover	60% Slope 75% Cover	60% Slope 50% Cover
8	0.4	0.5	0.8	0.9	1.5	1.5
10	2.6	2.8	5.3	5.4	9.7	9.9
11	1.4	1.5	2.6	2.7	4.6	4.7

One chain = 66 feet

Rate of spread is influenced more by change in slope than by changes in canopy cover. As noted in the table above, a 25% reduction in canopy cover will result in a minimal increase in spread rate, while a 20% increase in slope will nearly double the rate of spread. Fuel Model 11 as a slash fuel depicts lower rates of spread when compared to Fuel Model 10 because the rate of spread for Fuel Model 10 is influenced by the low live fuel moisture that occurs during severe burning conditions. On the ground, areas with heavier fuel loads more typical of a slash Fuel Model 11 and a live understory component will have rates of spread more typical of Fuel Model 10.

Currently, over the modeled range of conditions, the rate of spread does not exceed the line construction capabilities of a five person engine crew during initial attack. While the rates of spread remain within line construction capabilities, the fire line intensities (as displayed in Table 3-10) will limit the effectiveness of direct attack at the head of the fire without engines, dozers, or aircraft support.

Table 3-11 Rate of Spread for Moderate Conditions (50th Percentile Parameters)

Fuel Model	Rate of Spread in Chains per Hour					
	20% Slope 75% Cover	20% Slope 50% Cover	40% Slope 75% Cover	40% Slope 50% Cover	60% Slope 75% Cover	60% Slope 50% Cover
8	0.4	0.4	0.7	0.7	1.2	1.2
10	1.7	1.8	3.4	3.5	6.3	6.4
11	1.2	1.3	2.2	2.3	3.9	4.0

One chain = 66 feet

Under moderate burning conditions, there is a decrease in rate of spread for the fuel models that represent much of the Project Area. The reduced rate of spread, combined with a reduction in flame length, increases the likelihood of being able to effectively suppress a fire with limited resources.

3.3.3.2 Effects of No Action Alternative

With the No Action Alternative, conditions described above will persist for the short-term. Dense stands of trees will continue to self thin and surface fuels will continue to accumulate. Increased amounts of surface fuels will result in increased fire line intensities, and higher probabilities of crown fire behavior and wildfire-induced mortality. There will be no change in road access for suppression resources; therefore, there would be no change in capabilities of ground resources to reach a fire in initial attack phase.

The FFE-FVS model scenarios after 20 years indicate a trend toward increasing flame length which will negatively influence suppression capabilities and increase susceptibility to crown fire activity. Under 90th percentile conditions, all stands are projected to have flame lengths that limit direct attack suppression capabilities. A majority of stands within the Project Area would be susceptible to single tree and group torching. There is also a marked increase in wildfire-induced mortality.

Under 50th percentile conditions, there is a slight increase in flame lengths over time, which will begin to limit suppression effectiveness. In the majority of stands, fire is anticipated to remain on the surface. Wildfire-induced mortality is projected to remain relatively unchanged from current conditions. Table 3-12 displays the modeled conditions for the No Action Alternative at year 20.

Table 3-12 No Action – Projected Conditions in 20 Years

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	6’	P	99%	5’	P	83%
	Grouse	6’	A	100%	5’	S	24%
South and West Aspects	Long John	5’	P	94%	4’	S	19%
	Grouse	5’	P	42%	4’	S	16%
True Fir Stands							
All Aspects		6’	A	100%	4’	S	17%
DFPZs							
Cow Creek		5’	S	19%	4’	S	13%
Doe Peak		4’	P	97%	3’	S	21%
Four Corners		5’	P	97%	4’	P	15%
Siskiyou Gap		4’	P	15%	3’	S	15%
Siskiyou Peak		5’	A	100%	4’	S	23%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

With the No Action Alternative, there would be an increased amount of area with fire behavior that would be best represented by Fuel Models 10 and 11. As a result, more of the Project Area would be represented by the higher rates of spread displayed in Table 3-10 and Table 3-11. When combined

with the increase in fire line intensity, there would be a further reduction in suppression capability and an increase in the probability of large fire occurrence.

After a 40-year period, the trend continues. Under both severe and moderate weather conditions the projected fire line intensities would likely present serious control problems. Flame lengths would generally exceed direct attack capabilities with hand tools.

Most stands would experience crown fire activity under both moderate and severe conditions. Many stands would incur higher levels of mortality under moderate (50th percentile) conditions. Table 3-13 displays the modeled conditions for the No Action Alternative at year 40.

Table 3-13 No Action – Projected Conditions in 40 Years

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	8’	P	99%	6’	P	96%
	Grouse	7’	P	99%	6’	P	63%
South and West Aspects	Long John	7’	P	97%	6’	P	43%
	Grouse	6’	P	93%	5’	S	12%
True Fir Stands							
All Aspects		6’	A	100%	4’	P	57%
DFPZs							
Cow Creek		5’	S	19%	4’	S	13%
Doe Peak		6’	P	98%	5’	S	18%
Four Corners		7’	P	97%	6’	P	49%
Siskiyou Gap		5’	S	14%	4’	S	13%
Siskiyou Peak		6’	A	100%	4’	S	19%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

With the projected increase in fire behavior, particularly under moderate burning conditions, there will be further limitations to suppression effectiveness. This could be particularly problematic during a multiple-ignition lightning event, when initial attack resources may be limited. The likelihood of a large fire occurring within the Project Area will continue to increase.

The modeled results are consistent with observations of current stand conditions and general trends that can be expected in high density stands when left untreated. As stands reach maximum density, self thinning will occur resulting in mortality of less vigorous trees. As trees die and fall to the ground there will be accumulations of fuel on the forest floor, resulting in higher fireline intensities.

The initial stages of this process are already noticeable. Portions of the Project Area already have high levels of mortality and pockets of heavier fuel accumulations.

Indirect Effects

As fuel loading and fire hazard increase, the potential for fires that can escape initial attack will increase. This will have an indirect effect on the capability of the area to sustain late successional habitat characteristics.

The continued increase in stand density, combined with continued efforts to suppress fire, will result in stands that are vulnerable to other disturbance influences such as drought, insects or disease.

Cumulative Effects

As more areas develop into a higher fire hazard condition, with high levels of wildfire induced tree mortality, there will be a change in vegetative structure across the landscape if a wildfire occurs that cannot be contained at initial attack stage.

3.3.3.3 Effects of Alternative 2

This alternative proposes to treat fuels on a total 4,706 acres. Habitat improvement acres include silviculture treatments of variable density thinning (of trees up to 20” DBH) in 158 stands (2,589 acres) to promote development of late-successional forest characteristics. Thinning from below to reduce density and ladder fuels is proposed in 49 stands (1,286 acres) as part of a DFPZ strategy. Thinning of only small diameter trees (<9” diameter) is proposed in 47 stands (711 acres) to promote growth, reduce ladder fuels, and reduce surface fire intensity. Two stands (120 acres) are proposed for underburning, without mechanical treatment, to reduce the amount of surface fuel.

This alternative presents no substantive change to current access for suppression operations. A total of 9.3 miles of road are proposed for a change to year-round closure. Year round closure using a gate system (or similar removable barrier), would still provide access for ground resources. The proposed decommissioning of the 40S20 road (0.49 miles) would not negatively impact fire suppression efforts. Of particular importance from a fire suppression and fuels management perspective, is the proposal to place unauthorized road 40S06.2 (1.98 miles) on the transportation system. This ridge top road is located along a portion of the Doe Peak DFPZ. Addition of this road to the transportation system would maintain access along a key ridge system within the Project Area.

Under Alternative 2, 8.0 miles of current unauthorized roads would be used as temporary road spurs to implement the proposed action. The effects of this action would positively influence the ability to treat hazardous fuels in a more cost effective manner if road access is maintained until the surface fuels treatments are completed.

The range of fuels treatments proposed is based on site-specific stand conditions. The size of the remaining trees in the thinned stands, topography, size of stand, and proximity to control features (i.e., roads, streams, and ridges) all factor in to the fuels treatment selection. Each fuel treatment was modeled

Post-Thinning Stand Conditions

After the stands are thinned, they will be more susceptible to the effects of a wildfire until the fuels treatment is complete (Table 3-14). A lag time is expected between completion of thinning activities and completion of fuels treatments due to a variety of factors including weather, multiple contracts, safety issues, and timing of projects. This time lag may be from three to five years and varies by the kind of treatments that are prescribed and what kind of contract is used to complete the work. For example, machine piling and mastication usually take place right after thinning treatments while the equipment is available and on-site. Hand piling of vegetation is more time-consuming than machine piling and may take place the same season or the following season depending on weather. Burning of hand and machine piles is somewhat delayed because piled fuels often need about one year to dry out before they can be burned. Underburning has the longest lag time due to the required prescriptive factors or “burn windows” (e.g., temperature, relative humidity, wind speed, time of year) that need to be in place in order to achieve burn objectives and meet air quality standards.

During the period between thinning and fuels treatments, modeling suggests that all stands would have flame lengths that exceed direct attack capabilities under severe burning conditions. With the projected fireline intensity (>8’ flame length) in many of the stands, a wildfire would present control problems. Passive crown fire could be expected in the majority of stands. Wildfire-induced mortality remains high until the surface fuels are treated.

Under moderate burning conditions, flame lengths still exceed the desired 4’ flame length, but fire would remain on the surface in the majority of stands. Wildfire-induced mortality would be comparable to current conditions.

Table 3-14 displays the modeled conditions for stands after thinning and prior to the fuels treatment.

Table 3-14 Stands >9" DBH - Post-Thin Conditions (Prior to Fuels Treatment)

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	10'	P	95%	8'	S	22%
	Grouse	6'	P	50%	4'	S	14%
South and West Aspects	Long John	7'	S	33%	6'	S	13%
	Grouse	8'	S	30%	6'	S	14%
True Fir Stands							
All Aspects		6'	P	97%	5'	S	15%
DFPZs							
Cow Creek		8'	P	92%	7'	P	31%
Doe Peak		7'	S	34%	6'	S	20%
Four Corners		7'	P	95%	5'	P	26%
Siskiyou Gap		6'	S	24%	4'	S	12%
Siskiyou Peak		9'	P	99%	7'	S	77%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

A total of 1,202 acres are proposed for whole tree removal. This includes all stands proposed for thinning using ground-based equipment. The removal of limbs and tops would reduce the amount of surface fuel accumulation during the thinning operation. Whole tree removal would greatly reduce the susceptibility of the stands to wildfire prior to implementation of the fuels treatments.

Tops-attached tree removal is proposed for thinning stands to the extent possible (cable and helicopter yarded stands). The majority of fine fuels are contained in the top portion of the tree; removal of the tops with limb wood attached would lower the pre-fuels treatment fire risk in all thinning stands, reduce fine fuel loading and decrease fuel bed depth.

Mastication Fuels Treatment

A total of 751 acres are proposed to be masticated. Mastication is proposed in stands with slopes <35% where there is a substantial number of small diameter trees (<8"DBH). Thinning and reduction of the ladder fuels is accomplished through the use of equipment with a rotary drum or grinding head (masticator). This fuel treatment will result in a change in the surface fuel bed as small trees are shredded or chipped into small pieces. Mastication increases the amount of surface fuel available to burn as small trees are shredded into pieces. Although more fuel is placed on the surface, the fuel bed is more compact and generally burns with lower flame lengths and slower rates of spread when compared to similar quantities of unmasticated fuels.

The choice of masticator heads can influence the size and arrangement of material after treatment. Anecdotal observations of wildfire behavior in masticated fuel beds include low flame lengths and

rates of spread. The observed fire behavior is considered to be a function of the compact fuel bed created by the equipment. Additionally, higher levels of mortality have also been noted, presumably due to the amount of residence time of the burning material. The FFE-FVS model scenarios do not readily account for the change in fuel bed structure resulting from this treatment.

Initial research into fire behavior in masticated fuel beds supports the anecdotal observations. A comparison of fire severity and intensity of spring prescribed burns in natural and masticated stands (Bradley et al. 2006) reported an average flame length of 29" in previously masticated plots. Mortality in overstory trees (>8" DBH) was between 16% and 49% and in understory trees (<8" DBH) was between 47% and 98%. The stands were burned six months after the mastication treatment when the fuel bed was still loosely arranged on the surface. The spring prescribed burn was implemented during a vulnerable stage of plant development when leaf, bud, and cambium tissues were particularly susceptible to the heat released from the flaming front. Knapp et al. (2006) reported similar, though less severe, results when masticated stands received prescribed burning two to three years after mastication. This study reported flame lengths of 1'–2'; rates of spread of 1–3 chains per hour; higher than predicted scorch heights; and as much as 30% tree mortality. The study also contrasted observed fire behavior with predicted fire behavior as modeled in BehavePlus. Flame length and rate of spread were adequately predicted by the model, but actual scorch height was two to four times the model predictions. The initial mortality appeared to be due to crown scorch which can be mitigated by adjusting firing techniques and burning when air temperature is low (Knapp et al. 2006).

The current research indicates that initial flame lengths and rates of spread as modeled in this analysis can be reasonably anticipated, while anticipated mortality levels are likely to be underestimated. It should be noted that burning masticated stands is not proposed in this project. With the predicted flame lengths and rates of spread, a wildfire can be readily suppressed within masticated areas. The application of prescribed fire in the future would be appropriate, as the masticated fuel bed breaks down.

According to the models, after treatment the majority of stands (70%) are within the desired 4' flame lengths under severe burning conditions. Fire would remain on the surface in the majority of stands. Mortality levels are anticipated to be greatly reduced in all stands, with roughly 90% of the stands projected to incur <25% mortality.

Under moderate burning conditions, all stands are projected to be within the desired 4' flame length. Fire type is expected to remain as a surface fire. Wildfire-induced mortality is projected to exceed 25% on <5% of the stands. As previously stated, the fire behavior predictions are likely to be similar to actual burning conditions, while tree mortality in masticated stands may be underestimated.

Hand Piling and Burning Fuels Treatment

A total of 327 acres are proposed for hand pile and burn fuels treatment. Hand piling and burning of material is proposed in stands that will have a large number of small diameter trees remaining after the thinning has been accomplished and have slopes >35%. This treatment is proposed to reduce the risk of tree mortality that might be incurred during an underburn. Thinning out small trees and burning the piled material reduces the ladder and surface fuels and provides opportunities to underburn without incurring unacceptable levels of tree mortality. Since the stands proposed for hand pile treatment consist of higher numbers of small diameter trees, there would be high levels of mortality within those stands. Smaller trees are more susceptible to cambium kill and crown scorch which due to the thinner bark and low crowns.

In many stands this fuels treatment will be followed by an underburn. Some stands are comprised primarily of smaller diameter trees, are small in size, or are not readily accessible. Hand pile and burn is the only fuels treatment prescribed in these stands.

Under severe burning conditions roughly 75% of the stands are within the desired 4' flame lengths. A wildfire is primarily expected to remain on the surface. Less than 5% of the stands are expected to incur >25% wildfire-induced mortality.

Under moderate burning conditions, roughly 90% of the stands are within the desired 4' flame lengths. Fire is projected to remain on the surface in all stands. Wildfire-induced mortality is projected to be <25% in all stands.

Mastication Combined with Hand Piling and Burning Fuels Treatments

A total of 436 acres are proposed for a combination of mastication and hand pile burn fuels treatment. This includes stands which are predominately on slopes <35%, with steeper pitches where machinery cannot operate. Mastication will occur on the gentler slopes and the steeper portions of the stands will be hand piled and burned. The modeled scenarios for masticated stands and hand piled stands would apply to these acres, with a greater proportion of the area depicted by the mastication modeled scenario.

Underburning Fuels Treatment

A total of 1,382 acres are proposed for underburn fuels treatment after the mechanical treatment is completed. Underburning is proposed in stands with slopes >35%. Fires are intentionally lit under controlled conditions. Underburn prescriptions are designed to implement a low intensity fire which will consume surface fuels while maintaining scorch heights at low levels, thus minimizing impacts to retention trees. Underburning reduces the surface fuels and ladder fuels by consuming fuel on the

forest floor, killing smaller trees, and pruning the lower limbs of larger trees. It is proposed as the only fuel treatment in stands where numbers of small diameter trees are fewer and the anticipated mortality incurred during the underburn is within acceptable levels.

Under severe burning conditions roughly 80% of the post-treatment stands are within the desired 4' flame lengths. Fire is projected to remain on the surface in all stands. Wildfire-induced mortality is projected to be <25% in all stands.

Under moderate burning conditions all of the stands are within the desired 4' flame lengths. Fire is projected to remain on the surface in all stands. Wildfire-induced mortality is projected to be <25% in all stands.

Hand Pile and Burn Followed by Underburning

A total of 979 acres are proposed for a hand pile and burn treatment, followed by an underburn. The combined treatment is proposed in stands with a higher proportion of small diameter trees that occur within larger areas proposed for underburn fuels treatments. The hand pile and burn treatment will reduce the fuels to levels sufficient to allow an underburn to be completed without incurring unacceptable levels of mortality.

Under severe conditions roughly 65% of the stands proposed for the combined hand pile and underburn treatment would remain within the desired 4' flame lengths. Fire is projected to remain on the surface in all stands. Wildfire-induced mortality is projected to be <25% in all stands.

Under moderate burning conditions all of the stands are within the desired 4' flame lengths. Fire is projected to remain on the surface in all stands. Wildfire-induced mortality is projected to be <25% in all stands.

Underburn With No Mechanized Treatment

Two stands, totaling 120 acres, are proposed for underburn to reduce surface fuels. No mechanized treatments are proposed in these stands. Additional acreage to be underburned outside of mechanically thinned stands is incidental. Burn boundaries would follow logical features such as streams, roads and ridges.

Under both severe and moderate conditions the underburn area treatments would remain within the desired four foot flame lengths. Fire is projected to remain on the surface in all stands. Wildfire induced mortality is projected to be less than 20% in all stands.

Modeled Fuels Treatments—Five Years After Application

Table 3-15 displays the range of modeled conditions for treated stands the first five years after treatment. Refer to Wright (2007) for a detailed summary of the modeled results for each fuels treatment.

Table 3-15 Post-Fuels Treatments of Thinned stands >9" DBH

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	4'–6'	S	8%–14%	3'–4'	S	8%–14%
	Grouse	1'–5'	S	10%–17%	1'–4'	S	10%–17%
South and West Aspects	Long John	1'–4'	S	7%–14%	1'–3'	S	7%–14%
	Grouse	1'–7'	S	8%–20%	1'–5'	S	8%–13%
True Fir Stands							
All Aspects		4'	S	11%–15%	3'	S	11%–14%
DFPZs							
Cow Creek		1'–5'	S and P	10%–23%	1'–4'	S	10%–16%
Doe Peak		2'–4'	S	12%–17%	2'–3'	S	12%–15%
Four Corners		2'–4'	S and P	12%–28%	2'–3'	S	12%–17%
Siskiyou Gap		4'–5'	S	9%–13%	3'–4'	S	9%–12%
Siskiyou Peak		4'–5'	S and P	21%–37%	2'–4'	S	20%–26%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

Twenty Years After Fuels Treatments

Although there are predicted increases in flame lengths, generally fire behavior remains at reduced levels, when contrasted with No Action (Table 3-16). As trees within the stand increase in size, there is a substantial reduction in projected wildfire-induced mortality. Predicted changes in fire behavior over time are influenced by the fuels treatment method and initial condition of stands proposed for treatment. The predicted fire behavior and effects are discussed for each fuel treatment.

Mastication

The models depict a slow trend toward increased fire behavior. Under severe (90th percentile) burning conditions at year 20 the masticated stands are projected to have flame lengths comparable to No Action at the same time frame (see Table 3-12 and Table 3-16). But, a wildfire is anticipated to remain on the surface in a greater proportion of stands. Wildfire-induced mortality is anticipated to be lower, as the treated stands would consist of larger, more resilient trees.

Under moderate (50th percentile) burning conditions the models depict a slight improvement over No Action. In general, flame lengths are within the desired 4'. Fire would remain on the surface and wildfire-induced mortality would be <25%.

Hand Pile Treatments

With time, the hand piled stands are projected to remain more resilient when contrasted with No Action. Under severe conditions the majority of stands are projected to have desired flame lengths of 4'. Under moderate conditions flame lengths in all stands are projected to be at, or below 4'. Under both severe and moderate conditions a wildfire is projected to remain on the surface and wildfire-induced mortality is <25% in all stands.

Underburn Treatments

With time stands that receive an underburn treatment are projected to remain more resilient when contrasted with No Action. Under severe conditions the majority of stands are projected to have desired flame lengths of 4'. Under moderate conditions flame lengths in all stands are projected to be at, or below 4'. Under both severe and moderate conditions a wildfire is projected to remain on the surface and wildfire-induced mortality is <25% in all stands.

Hand Pile and Burn Followed by Underburning

With time, these stands are projected to become more resilient. At 20 years roughly 95% of the stands have flame lengths within the desired 4' under severe burning conditions. Under moderate burning conditions all stands are projected to have flame lengths within the desired 4'. Under both severe and moderate conditions a wildfire is projected to remain on the surface and stand mortality is projected at <25% for all stands.

Underburn with no Mechanized Treatment

Two stands, totaling 120 acres, are proposed for underburn to reduce surface fuels. No mechanized treatments are proposed in these stands. Additional acreage to be underburned outside of mechanically thinned stands is incidental. Burn boundaries would follow logical features such as streams, roads and ridges.

Under both severe and moderate conditions the underburn area treatments would remain within the desired four foot flame lengths. Fire is projected to remain on the surface in all stands. Wildfire induced mortality is projected to be less than 20% in all stands.

Modeled Fuels Treatments—20 Years After Application

Table 3-16 displays the range of modeled conditions for treated stands 20 years after treatment. Refer to Wright (2007) for a detailed summary of the modeled results for each fuels treatment.

Table 3-16 Alternative 2 Fuel Treated Stands at 20 Years

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	4'–7'	S and P	8%–56%	3'–5'	S	7%–14%
	Grouse	1'–5'	S	9%–17%	1'–4'	S	9%–17%
South and West Aspects	Long John	1'–5'	S	6%–14%	1'–4'	S	6%–14%
	Grouse	2'–6'	S	7%–13%	2'–4'	S	7%–13%
True Fir Stands							
All Aspects		4'–6'	P	11%–95%	3'–4'	S	11%–12%
DFPZs							
Cow Creek		2'–5'	S and P	10%–63%	1'–4'	S and P	10%–17%
Doe Peak		3'–5'	S	9%–17%	2'–4'	S	9%–15%
Four Corners		2'–5'	S and P	11%–19%	2'–3'	S	11%–17%
Siskiyou Gap		4'–5'	S	9%–10%	2'–3'	S	9%–10%
Siskiyou Peak		4'–6'	S and P	20%–97%	2'–4'	S	19%–25%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

Forty Years After Fuels Treatments

There is minimal change in fire behavior predicted between year 20 and year 40. Fire behavior is lower in Alternative 2 than predicted for the No Action Alternative during the same time frame. Accumulations of surface fuels will be reduced in treated stands, as contrasted with No Action, which will continue to self thin as less vigorous trees in overly dense stands die and fall to the ground. Wildfire-induced mortality is predicted to continue to decrease. As stands continue to develop and grow, trees are more resilient to the effects of fire.

Mastication

Under severe conditions flame lengths are still projected to remain at levels that make direct attack with hand tools difficult, but there is a slow trend toward reduced fire line intensities. The majority of the Project Area would experience surface fire and mortality levels projected to be <25% in all but the true fir stands.

Under moderate conditions, much of the area is within the desired 4' flame lengths. A wildfire is project to remain on the surface, and mortality levels are projected to be <25% in all masticated stands.

Hand Pile Treatments

After 40 years the modeled scenarios indicate a slight upward trend in fire line intensity. The majority of stands still remain within the desired 4' flame lengths under severe burning conditions. All stands are within the desired 4' flame lengths under moderate burning conditions. Under both severe and moderate conditions a wildfire is projected to remain on the surface. With the combination of low fireline intensities and increased growth of the trees in the treated stands, the anticipated wildfire-induced mortality remains very low.

Underburn Treatments

After 40 years, similar to the modeled scenarios for other proposed fuels treatments, there is a slight upward trend in fire line intensity. The majority of stands still remain within the desired 4' flame lengths under severe burning conditions. All stands are within the desired 4' flame lengths under moderate burning conditions. Under both severe and moderate conditions a wildfire is projected to remain on the surface. With the combination of low fireline intensities and increased growth of the trees in the treated stands, the anticipated wildfire-induced mortality remains very low.

Hand Pile and Burn Followed by Underburning

After 40 years there is minimal change. Between year 20 and year 40 only the true fir stands show an increase in flame length above 4' under severe burning conditions. Under moderate conditions the flame lengths are projected to be within 4' for all stands. A wildfire is projected to remain on the surface under both severe and moderate conditions. Wildfire-induced mortality remains under 25% under both severe and moderate conditions.

Underburn with no Mechanized Treatment

After forty years there is minimal change. There is a minimal increase in projected flame length. A wildfire is projected to remain on the surface under both severe and moderate conditions. Wildfire induced mortality is remains under 15% under both severe and moderate conditions.

Modeled Fuels Treatments—40 Years After Application

Table 3-17 displays the range of modeled conditions for treated stands 40 years after treatment. Refer to Wright (2007) for a detailed summary of the modeled results for each fuels treatment.

Table 3-17 Alternative 2 Fuel Treated Stands at 40 Years

Watershed		90th Percentile Conditions			50th Percentile Conditions		
		Flame Length	Fire Type[1]	BA Mortality	Flame Length	Fire Type[1]	BA Mortality
Mixed Conifer Stands							
North and East Aspects	Long John	5'–6'	S	6%–13%	3'–5'	S	5%–11%
	Grouse	4'–6'	S	7%–12%	3'–5'	S	7%–10%
South and West Aspects	Long John	3'–6'	S	5%–13%	3'–5'	S	5%–9%
	Grouse	3'–5'	S	6%–8%	2'–4'	S	6%–8%
True Fir Stands							
All Aspects		5'–6'	S and P	9%–77%	3'–4'	S	9%–11%
DFPZs							
Cow Creek		3'–5'	S	9%–20%	2'–4'	S	8%–13%
Doe Peak		2'–4'	S	8%–14%	2'–3'	S	8%–10%
Four Corners		3'–4'	S and P	8%–17%	2'–4'	S	8%–12%
Siskiyou Gap		4'–5'	S	7%–9%	3'	S	7%–8%
Siskiyou Peak		4'–6'	S	15%–22%	3'–4'	S	15%–20%

[1]P– Passive crown fire; A – Active crown fire; S – Surface fire

Rate of Spread

The surface fire rate of spread is partially influenced by the amount of wind that can reach the flames at the surface (mid-flame wind speed). In the short term after treatment, the stands will be in a relatively open condition increasing the amount of wind that can reach the surface when compared with closed stand conditions.

A 20% slope represents the gentler topography in the Project Area. The steeper terrain is represented by 60% slope. Slope influences rate of spread far greater than canopy cover. A 50% canopy cover represents the denser stands. The more open stands are represented by 25% canopy cover. The canopy cover range represents the amount of overstory that could be anticipated immediately post-treatment. As the remaining trees continue to grow and reoccupy the available growing space, there will be a slow trend toward increased canopy cover.

Fuel Model 13 represents the worst case fire behavior that could be expected after thinning, prior to completion of the fuels treatment. Fuel Models 8 and 10 best represent the fire behavior that could be expected after the fuels treatment is complete. Fuel Model 9 represents the fire behavior that could be expected in pine-dominated stands. Fuel Model 11 best represents fire behavior that could be expected in masticated stands. Mastication will not occur on slopes >35%, therefore post-treatment rate of spread was not calculated for Fuel Model 11 on 60% slope.

The rates of spread projected for each of these fuel models are displayed in Table 3-18 and Table 3-19.

Table 3-18 Rate of Spread for Severe Conditions – 90th Percentile Parameters

Fuel Model	Rate of Spread in Chains[1] per Hour					
	20% Slope 50% Cover	20% Slope 25% Cover	40% Slope 50% Cover	40% Slope 25% Cover	60% Slope 50% Cover	60% Slope 25% Cover
8	0.5	0.6	0.9	1.0	1.5	1.7
9	1.6	2.2	3.2	3.8	5.9	6.5
10	2.8	5.0	5.4	7.7	9.9	12.1
11	1.5	2.7	2.7	3.9	Not Modeled	Not Modeled
13	4.3	8.8	7.7	12.2	13.4	17.9

[1]One chain = 66 feet

After the fuels treatment is accomplished, the projected rate of spread does not exceed the line construction capabilities of a five person engine crew during initial attack. Combined with the reduction in fire line intensities, a greater amount of the Project Area remains well within initial attack capabilities. The rates of spread for Fuel Model 13 combined with the fire line intensities (as displayed in Table 3-9 will limit the suppression effectiveness in the short term. The Project Area would remain at higher susceptibility to loss until the fuels treatments are complete.

Table 3-19 Rate of Spread for Moderate Conditions – 50th Percentile Parameters

Fuel Model	Rate of Spread in Chains[1] per Hour					
	20% Slope 50% Cover	20% Slope 25% Cover	40% Slope 50% Cover	40% Slope 25% Cover	60% Slope 50% Cover	60% Slope 25% Cover
8	**0.4**	**0.5**	**0.7**	**0.8**	**1.2**	**1.4**
9	**1.3**	**1.8**	**2.6**	**3.1**	**4.8**	**5.3**
10	**1.8**	**3.2**	**3.5**	**5.0**	**6.4**	**7.9**
11	**1.3**	**2.3**	**2.3**	**3.3**	**Not Modeled**	**Not Modeled**
13	**3.6**	**7.3**	**6.4**	**10.1**	**11.1**	**14.8**

[1]One chain = 66 feet

Under moderate burning conditions, there is a decrease in rate of spread for the fuel models which represent much of the Project Area. Prior to completion of the fuels treatment, stands within the project still remain susceptible to loss under moderate condition.

Once the fuels treatments have been accomplished the reduced rate of spread, combined with a reduction in flame length, increase the likelihood of being able to effectively suppress a fire with limited resources. Additionally, the reduction in fire behavior provides options for initiating an appropriate management response. Under an appropriate management response fire managers may safely contain fires within boundaries of previously treated features, rather than take immediate suppression action.

Summary Conclusions for Alternative 2 – Proposed Action

In summary, all fuels treatment options show a positive effect on reducing fire behavior and fire effects. All fuels treatments result in substantial reductions of wildfire-induced mortality. The reduction in surface and ladder fuels also minimizes the potential for torching and crown fire activity. Although the models indicate that some treatments will exceed the desired 4' flame length under severe burning conditions, conditions are improved over No Action for the same stand category at the same point in time.

Indirect Effects

With the distribution of stands and varied fuels treatments proposed under Alternative 2, much of the analysis area would be resilient to the effects of future wildfires. The proposed treatments provide options beyond immediate initial attack. Managers will have an increased capability of implementing an appropriate management response allowing fires to be contained within previously treated stands.

The condition of the DFPZ would increase suppression capabilities and minimize the suppression impacts. With the DFPZs at a level of reduced fuel, there would be increased flexibility to implement suppression tactics aimed at keeping a fire out of the Project Area. The impacts of the suppression activities could be reduced, as the conditions of the stands would allow for application of less impacting suppression tactics.

Cumulative Effects

As more areas are maintained at a lower fire hazard condition, with reduced levels of wildfire-induced mortality, there will be a change in vegetative structure across the landscape. Stand conditions will be more consistent with what would be expected in a historical fire regime. There will be a higher likelihood of sustaining the late-successional habitat characteristics desired within the LSR.

3.3.3.4 Effects from Alternative 4

Alternative 4 implements the same array of fuel treatments. The differences between Alternative 4 and Alternative 2 are the acres of proposed treatments. The small diameter stands proposed for thinning and the stands proposed for underburn without mechanical treatment remain unchanged. The differences are in the number of acres proposed for thinning to promote late successional characteristics and DFPZs. Changes in logging systems and access may also result in changes in proposed fuels treatments.

This alternative proposes to treat 4,185 acres. Silviculture treatments include variable density thinning in 119 stands (2,079 acres) to promote development of late-successional forest characteristics. Thinning to reduce density and ladder fuels is proposed in 49 stands (1,275 acres) as part of a DFPZ strategy. Thinning of only small diameter trees is proposed in 47 stands (711 acres) to promote growth, reduce ladder fuels, and reduce surface fire intensity. Two stands (120 acres) are proposed for underburning, without mechanical treatment, to reduce the amount of surface fuel.

This alternative proposes similar road actions as Alternative 2. There would be no difference in access for suppression ground resources.

The effects of the fuels treatments in the tables presented in Alternative 2 are valid for the treatment categories for this alternative. The difference is in the amount of acres treated and the distribution of the treated stands.

In Alternative 4 there is roughly a 20% reduction in the total number of acres proposed for treatment to develop late successional habitat characteristics compared to Alternative 2. Fewer acres are proposed for treatment in each stand category with the biggest reduction of acres occurring in true fir stands.

There is a 30% reduction in treated acres in the true fir stands. On the north and east aspect stands there is a 25% reduction of acres treated in Long John drainage and a 20% reduction of acres treated in Grouse Creek. On the south and west aspects there is an 18% reduction of acres treated in Grouse Creek and an 8% reduction of acres treated in Long John drainage.

Implementation of Alternative 4 would result in the highest reduction of treated acres in the stand categories which appear to be currently least resilient to the effects of wildfire. This will result in a greater proportion of the Project Area that would be susceptible to uncharacteristic, high severity wildfire. Treated stands are still well distributed throughout the watershed, providing options for containing a wildfire at smaller sizes than would be expected with no action.

The focus on treating a greater proportion of stands on the south and west aspects in the mixed conifer zone is consistent with moving stands toward conditions more typical of the fire regime of the area.

There is a 5% reduction in the number of acres proposed for treatment in the DFPZ. This is due to deferring treatment of stands in the Doe Peak and Siskiyou Gap DFPZs. Deferral of the treatment stand in the Doe Peak DFPZ should have a minimal impact on the DFPZ effectiveness, it occurs lower on the slope and much of the surrounding area is still proposed for treatment. The reduction of

5 acres in the Siskiyou Gap DFPZ is considered incidental to the effectiveness of its functioning capability.

Summary Conclusions for Alternative 4

With fewer acres treated, there will be an increase in the amount of area that would remain highly susceptible to the effects of a wildfire. Although there is a 20% reduction in acres treated when contrasted with Alternative 2, this alternative still meets the purpose and need for reducing the effects of wildfire at a landscape scale. Although there is an increase in the number of acres that have the ability to burn at higher severities, the distribution of treated stands provides options for successfully confining a wildfire to smaller acreages.

3.3.3.5 Effects of Alternative 5

Alternative 5 implements the same array of fuel treatments. The primary differences between this alternative and Alternative 2 are the acres of proposed treatments within the DFPZ. The small diameter stands proposed for thinning and the stands proposed for underburn without mechanical treatment remain unchanged. The differences are in the number of acres proposed for thinning to promote late successional characteristics and DFPZs. Changes in logging systems and access also result in minor changes in proposed fuels treatments.

This alternative proposes to treat 4,612 acres. Silviculture treatments include variable density thinning in 159 stands (2,579 acres) to promote development of late-successional forest characteristics. Thinning to reduce density and ladder fuels is proposed in 50 stands (1,202 acres) as part of a DFPZ strategy. Thinning of only small diameter trees is proposed in 47 stands (711 acres) to promote growth, reduce ladder fuels, and reduce surface fire intensity. Two stands (120 acres) are proposed for underburning, without mechanical treatment, to reduce the amount of surface fuel.

From a fire and fuels perspective this alternative is very similar to Alternative 2. Basically the same stands are proposed to be treated. Acreage adjustments are a result of changes in accessibility. The primary difference is 68 acres proposed for mastication in Alternative 2 are proposed to be underburned in this alternative. The effects of the fuels treatments in the tables presented in Alternative 2 are valid for the treatment categories for this alternative.

There is roughly a 5% reduction in acres treated within the DFPZs. Within each DFPZ, the reduction of treated acres is minimal. The majority of DFPZ treatment units that have been deferred are within Doe Peak and Siskiyou Peak, both of which are interior defense zones within the Project Area. The deferred portion of the Doe Peak DFPZ occurs on relatively gentle topography in the upper reaches of the watershed. The effects of deferring this portion of the DFPZ should be of minimal impact to

future wildfire suppression or fuels treatment actions due to its position in the Project Area and proximity to other stands still proposed for treatment in this alternative.

This DFPZ was designed to stop short of the primary ridge due to its proximity to currently suitable late-successional habitat. This DFPZ has no effect on fire coming from outside the Project Area. The deferred portion of the Siskiyou Peak DFPZ occurs in the upper most reach of the treatment zone. Deferral of this additional segment of DFPZ will have little impact on future suppression or fuels treatment options within the remainder of the Project Area.

Summary Conclusions for Alternative 5

With the minor differences in acres treated, there are no appreciable differences from Alternative 2 relative to projected fire behavior, wildfire effects, and suppression effectiveness.

3.3.3.6 Effects of the Preferred Alternative

The Preferred Alternative implements the same array of fuel treatments as the other action alternatives. The primary differences between this alternative and Alternative 5 are the acres of proposed underburning, mechanical treatments, and the logging systems. Fuels treatments were modified to increase the number of acres proposed for underburning and mastication while reducing the number of acres proposed to be handpiled prior to underburning. This alternative differs from all action alternatives in that an additional 1,297 acres of underburn treatments are proposed to be implemented outside of mechanically treated stands. The small diameter stands proposed for thinning and the stands proposed for underburn without mechanical treatment remain unchanged.

In the Preferred Alternative, batched underburning is proposed in order to treat fine diameter ground and ladder fuels. The batched underburn areas (six areas) consist of consolidated thinning units and the areas around them that make up logical boundaries for containing and controlling prescribed fire (refer to Map 14). Underburning is the most effective means of reducing small (3” in diameter or less) surface fuels and ladder fuels by consuming fuels on the forest floor, killing smaller trees, and pruning the lower limbs of larger trees (Journey 2007). Fine fuels are the primary carrier of wildfire, affecting the rate of spread and intensity of the initial flame front. Crown fires are supported by surface and ladder fuels. Crown fires independent of surface and ladder fuels are rare, requiring high wind and sufficient crown continuity to support the fire. Therefore, fine fuels are the most important size class of fuels to treat in order to influence fire behavior (ibid). Within the six batched underburn areas, there would be a more natural variation and mosaic throughout the stands post-treatment. Underburning would result in areas with low and moderate intensity burn patterns and help move the area towards the historic mixed severity fire regime. Low intensity underburning would favor fire resilient species and promote the conditions described in the Desired Condition (ibid).

This alternative proposes to treat 5,765 acres. Silviculture treatments to promote the development of late-successional forest characteristics will occur on 2,543 acres in 154 stands. Thinning to reduce density and ladder fuels will occur on 1,058 acres in 42 stands as part of the DFPZ treatments. Thinning of only small diameter trees is proposed in 47 stands (711 acres) to promote growth; reduce ladder fuels and reduce surface fire intensity. Roughly 1,450 acres are proposed for underburning without mechanical treatment to reduce the amount of surface fuel.

With the addition of the underburn treatment stands, this alternative treats the greatest number of acres. Treatment areas in this alternative focus on the mixed conifer stands where there is the greatest degree of departure from the natural fire return interval. Approximately 90% of the acres treated in this alternative are in Condition Class 3 (Creasy 2008).

The addition of the area wide underburn treatment increases the connectivity of treated stands. This should result in increased flexibility when a wildfire occurs. If initial attack suppression actions are chosen, there will be an increased likelihood of success, since roughly 10% more acres would be treated. The increase in treated acres also provides more opportunity to implement a confine and contain strategy, allow wildfires to be contained within logical boundaries of previously treated areas. This would result in greater opportunity for fire to function as a process within the LSR. Regardless of what type of suppression response is chosen, there is a lower likelihood of a future wildfire resulting in unacceptable fire effects given the proportion of area treated.

3.3.3.7 Comparison of Alternatives

All action alternatives propose thinning of only small diameter trees (<9” diameter) in 47 stands (711 acres) to promote growth, reduce ladder fuels, and reduce surface fire intensity. All action alternatives propose to underburn two stands (120 acres) without mechanical treatment to reduce the amount of surface fuel. All action alternatives meet the purpose and need for treatment to reduce the threat of wildfire within the Project Area.

There are less DFPZ acres treated for Alternatives 4, 5, and the Preferred Alternative when compared to Alternative 2. As previously stated in the discussion of each alternative, the reduction in acres is not anticipated to substantially reduce the effectiveness of the DFPZ and the ability of the alternative to meet the purpose and need for action.

Table 3-20 and Table 3-21 display the fuels treatment acres by alternative for both habitat improvement stands and DFPZ.

Table 3-20 Summary of Habitat Improvement Fuels Treatment Acres by Alternative

Fuels Treatment	Total Acres				
	No Action	Alternative 2	Alternative 4	Alternative 5	Preferred Alternative
Masticate	0	526	316	492	541
Hand Pile Burn	0	291	177	282	543
Underburn	0	1,157	1,099	1,182	1,198
Hand Pile Burn and Underburn	0	522	403	530	85
Masticate and Hand Pile Burn	0	93	84	93	42
Riparian Reserve Fuels Treatments	0	303	303	303	303
Underburn/No Mechanical	0	120	120	120	1,453
Total	0	3,012	2,502	3,002	4,165

Table 3-21 Summary of DFPZ Fuels Treatment Acres by Alternative

Fuels Treatment	Total Acres				
	No Action	Alternative 2	Alternative 4	Alternative 5	Preferred Alternative
Masticate	0	225	219	195	396
Hand Pile Burn	0	36	32	62	23
Underburn	0	225	219	226	718
Hand Pile Burn and Underburn	0	457	536	437	55
Masticate and Hand Pile Burn	0	343	269	282	0
Total	0	1286	1275	1202	1192

FRCC

The project alternatives were analyzed in GIS to determine how proposed treatment areas may affect Fire Regime Condition Class (FRCC). Two measures of FRCC were investigated: (1) FRCC based on departure of current vegetation structure (seral class distributions) from historic reference conditions, hereafter referred to as FRCCvs, and (2) FRCC based on departure of current fire return intervals from historic fire return intervals, hereafter referred to as FRCCfri.

The vast majority of proposed treatment units occur in areas with moderate to severe departure of FRCCvs (Figure 3-5 Percent of Treatment Area by FRCCvs).

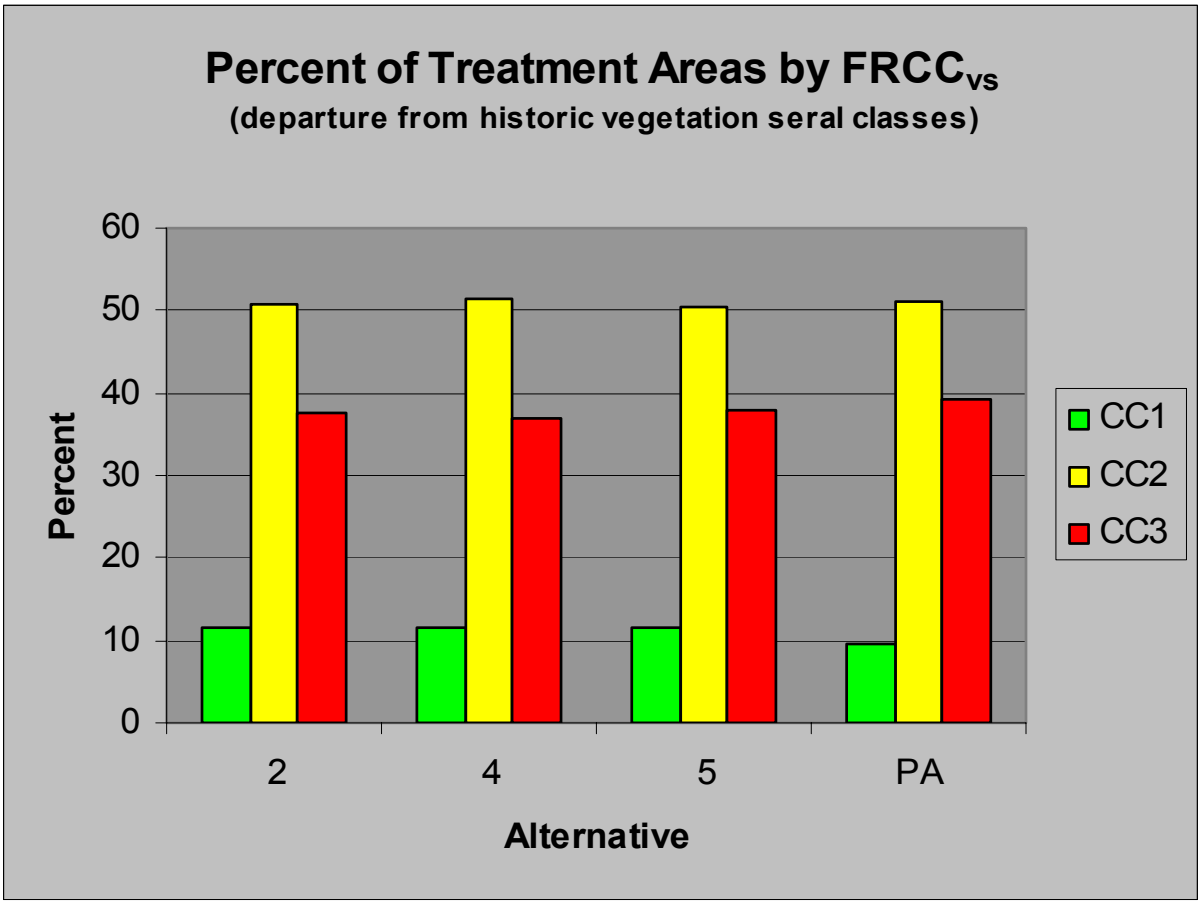

Figure 3-5 Percent of Treatment Area by FRCCvs

For all alternatives, the area in FRCCvs 2 or 3 exceed 88 % of proposed treatments, with the Preferred Alternative having the greatest proportion in FRCCvs 2 and 3 (>90%).
The area in condition class 2 or 3 by the FRCCfri measure is even more pronounced (Figure 3-6 Percent of Treatment Area by FRCCfri).

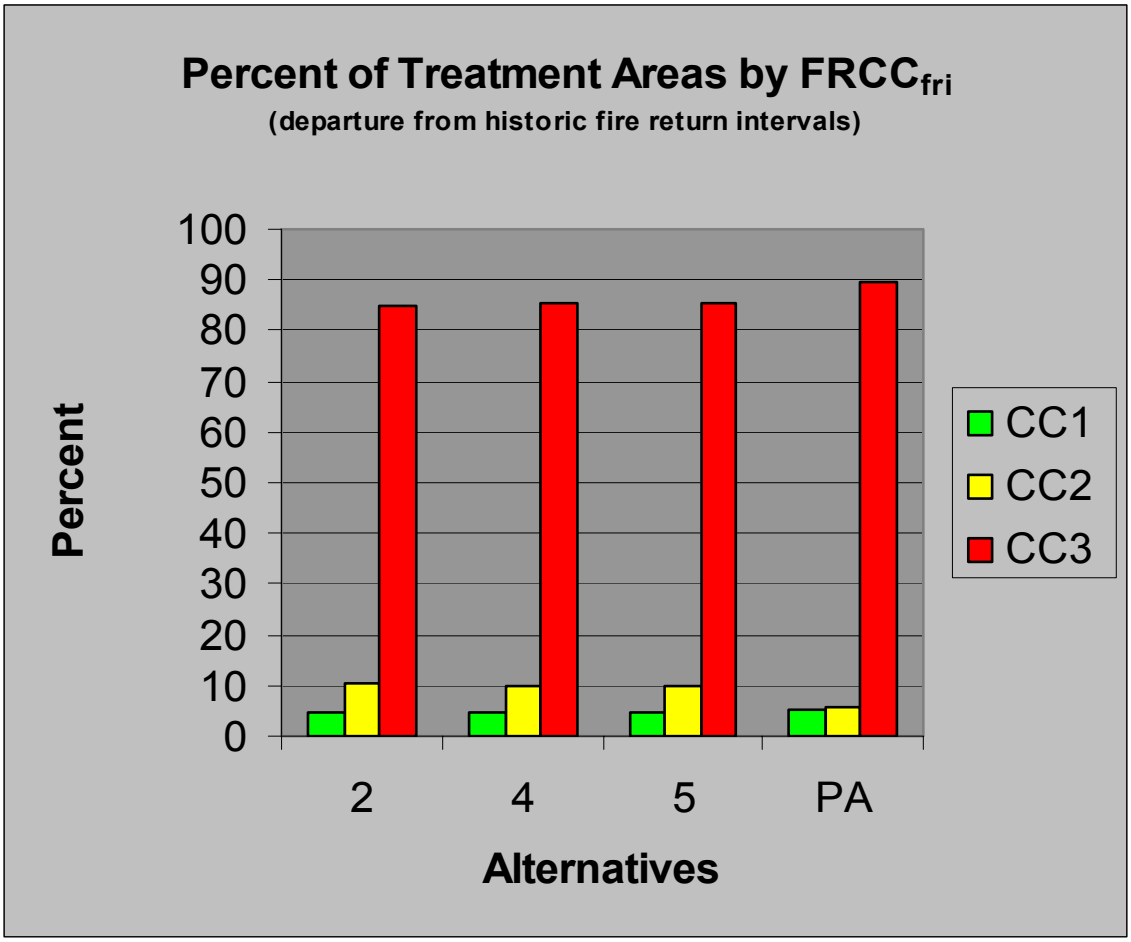

Figure 3-6 Percent of Treatment Area by FRCCfri

What is most striking is the area occupied by FRCCfri 3, lands that are severely departed from historic fire return intervals.

All alternatives will help to move the landscape toward desired condition class ratings. Thinning projects will affect the FRCCvs measure by moving dense stands (generally a surplus condition) to more open conditions (generally a deficit condition). The Preferred Alternative has the greatest potential to have positive affect to FRCCvs because of greater number of acres treated (thinned) in FRCCvs 2 and 3.

The FRCCfri measure will be most improved in the Preferred Alternative because, although the acres being thinned are reduced, there is an added component of prescribed underburn acres. Prescribed fire, wildland fire uses (WFU) and appropriate management response (AMR) to wildland fire offer the best tools to address departures in fire return intervals. The prescribed fire acres proposed, once implemented, will give managers more latitude to use WFU and AMR. Restoring

fire to these lands will have added benefit of restoring fire ecosystem functional processes as well as structural and compositional changes.

3.4 Aquatic Resources

One significant issue identified for this project relates to cumulative watershed effects. The use of ground based yarding systems during thinning, fuels treatments, and road activities, when combined with effects of past, present and foreseeable future actions, may result in increased sediment production and peak flow that could impact water quality, channel stability, and aquatic habitat. The key indicators used to analyze this issue are:

- Cumulative Watershed Effects (CWE) model outputs; and
- Project effects to anadromous fish habitat, specifically temperature, substrate embeddedness, and peak flows.

3.4.1 Analysis Methods

3.4.1.1 Cumulative Watershed Effects Modeling

The Forest cumulative watershed effects (CWE) analysis uses three models that characterize watershed risk: USLE (surface erosion and potential sediment delivery); GEO (potential sediment delivery from mass wasting); and ERA (disturbance index). USLE is an index of predicted potential sediment delivery for the first year following project completion. GEO estimates potential sediment delivery for the first decade after project completion. ERA provides an index for tracking ground disturbing activities which potentially alter peak runoff flows and watershed processes (channel stability, sediment transport, aquatic habitat, etc.). All three of these models have been calibrated using local data, and have been validated on the ground.

Direct and indirect effects of the project on watershed conditions are described and included in the cumulative effects analysis. The baseline data used for modeling cumulative effects includes past, present, and reasonably foreseeable future activities that affect the condition of the watersheds influenced by the Project Area. Modeling is done at two scales, the smaller 7th field watersheds and the larger 5th field watersheds. The 7th field watersheds affected by the project are Deer-Beaver Creek, Upper Cow Creek, Long John Creek, Beaver-Grouse Creek (within the Beaver 5th field watershed), and Headwaters Cottonwood Creek (within the Cottonwood 5th field watershed). Cumulative effects analysis at the 5th field scale considers all the 7th field tributary watersheds, including those where no activities are proposed. The 5th field watersheds are Beaver Creek and

Cottonwood Creek. Impacts to Cottonwood Creek were not analyzed in this document because only a very small amount of ridgetop activity (about 200 acres) will be occurring in that 63,561 acre watershed (none in Riparian Reserves) and effects would not be quantifiable within the model outputs.

The USLE and GEO models estimate sediment delivery to streams by considering disturbance type and land sensitivity and the ERA model provides an index of land disturbance within a watershed. As additional watershed disturbances occur over space and time, the risk of initiating or contributing to existing CWEs increases. A continuum exists from lower to higher risk of adverse impacts. The condition of watersheds within this continuum is expressed as a risk ratio. Each of the three models has an inference point that helps to identify susceptibility within the risk continuum. To assess potential project impacts and compare alternatives, post-project risk ratios are compared to inference points and existing condition risk ratios.

Each model has been locally calibrated for inference points of 1.0 (along the risk continuum). A risk ratio of 1.0 or greater is used as a management guideline to indicate a point in a continuum above which the potential risk of adverse impacts is incrementally increased. Watersheds on the KNF with risk ratios greater than 1.0 are generally more densely roaded, have sensitive land types such as dormant landslides or granitic soils, and/or other factors that lead to a degraded condition.

Risk ratios are not rigid, determinant values for predicting CWEs and differences of a few tenths (e.g., 0.7 versus 0.9, or 1.1 versus 1.3) are difficult, if not impossible to discern adverse impacts in the field. Therefore, risk ratios near 1.0 (the inference point) are most useful when considered as "yellow-flag indicators" where a cautious approach to management actions applies. The best interpretation of the risk ratios comes from an understanding of model sensitivities and limitations, which is described for USLE, GEO, and ERA in specialist reports (de la Fuente 2008; Bousfield et al. 2008; Snavely 2008b; Bousfield et al. 2008; Elder 2006; Laurent 2008) and in the following sections.

USLE Modeling

Soil loss models provide numerical procedures for linking soil erodibility, site conditions, and management practices to cumulative impacts on channel conditions. Modeling is used as a tool to guide and support management decisions based on professional judgment and long-term knowledge of local history, geology, stream sensitivity, and many other factors. The complexity of forested mountain hillslopes and watersheds limits the precision of model output (Croke and Nethery 2006; Gonzalez-Bonorino and Osterkamp 2004) but models calibrated to local conditions are crucial for assessing extensive landscapes and planning management and/or watershed restoration activities (Dunne et al. 2001).

USLE (Universal Soils Loss Equation) predicts potential sediment delivery to streams from surface erosion. KNF watershed managers use a locally calibrated version of the USLE to assess current watershed conditions and estimate additive effects of forest restoration and management alternatives. Although the USLE was developed for estimating soil loss from erosion on agricultural lands (Wischmeier and Smith 1965), its use in forested mountain landscapes is common in the US and worldwide (Bahadur and Hirofum 2006; Berg et al. 1996; Croke and Nethery 2006; Ozhan et al. 2005). Problems with use of certain functions developed for more homogenous landscapes are recognized, but generally, if locally calibrated, USLE is a reliable, easy-to-use, and conservative approach (tends to over-estimate sediment production) for planning, confirming, or reassessing land use decisions.

Cover et al. (2006, 2008) used the KNF version of USLE to compare measured sediment storage in stream pools and riffles to modeled sediment loss and found very strong correlations, suggesting that the model accurately assesses and predicts CWE.

For planning purposes, the volume of soil loss calculated by the model for an existing or planned condition is compared to a background value determined by running the model for the same area without disturbance. The difference between existing or possible future condition and background is divided by the background and multiplied by 100 to get a measure of accelerated sedimentation, or percent over background (POB). This value is then divided by a threshold value of 400% or four times background, which has been determined through many years of observation and experience of KNF watershed managers to be the inference point where detrimental changes to beneficial uses in streams can be expected to increase. This is expressed as a risk ratio, (POB/4).

The 400% over background value is the result of many years of observation. It has been upheld in recent watershed studies (Cover et al. 2006, 2008). Considering that management impacts (other than roads) are temporary, and that background levels of sediment production from hillslope runoff in these forests are very low, four times background is a conservative estimate for a threshold of detrimental effects.

USLE Assumptions and Limitations

Assumptions and limitations of the model include:

1. Predicted sediment delivery is for the first 12 months following project completion. Sedimentation rates expressed by the model are realized from a 6-hour maximum rainfall with a 2-year recurrence interval.

2. Model results are developed from 10 years' worth of plot data collected on the KNF.

3. The primary source of erosion calculated through the model is sheet erosion.

4. Broad-scale maps that average precipitation events are used in USLE calculations.

5. The model results are conservative estimates because they do not account for the functional riparian reserve buffers that are being implemented which trap and keep sediment from reaching streams.

6. With maintenance of high soil cover (>80%), project effects will fully recover within 3 years.

GEO Modeling

GEO is a spatially-explicit GIS-based model that estimates potential landslide sediment produced (cubic yards/year) in a given watershed under existing road, harvest, and fire disturbances and compares this amount to that which would be expected if the watershed were completely undisturbed. It is based on empirical relationships derived from air photo assessment and field investigations of landslide occurrence in the Salmon River sub-basin of the KNF (de la Fuente and Haessig 1994). The model estimates sediment delivery for a 10–20 year storm event using a matrix of sediment delivery coefficients based on geomorphic terrane (a landscape stratification based on geomorphic type, bedrock, and slope gradient) and disturbance type (background, roads, fire/harvest).

The KNF uses sediment production predictions from the GEO model to calculate risk ratios which can then be used to compare the potential increased risk of sediment delivery for different land management scenarios. GEO risk ratios are derived by (1) determining the predicted increase in sediment production due to management actions (existing and future) over undisturbed (background) conditions, and (2) comparing the predicted increase (expressed as percent over background) to a management threshold value (de la Fuente 2007, 2008; Elder and Reichert 2004). The threshold value (used to calculate the inference point) is the amount of increase in landslide production (also expressed as percent over background) at which KNF watershed personnel believe impacts are likely to occur.

The threshold value for GEO is 200% over background. The threshold value was established by comparing landslide model outputs to field conditions across the forest. Forest-wide comparisons indicated that most watersheds exhibiting field evidence of adverse CWEs, such as high embeddedness or channel instability, were found to have GEO model outputs of 200% or greater over background (Elder and Reichert 2004).

Since development, the model has undergone additional validation and refinement. Following a large storm event (15–20 year recurrence interval) that occurred in 1997, new landslide inventory data for the KNF was used to refine sediment delivery coefficients to better reflect actual observed conditions. Field and air photograph interpretation were conducted to accurately measure landslide volume produced by storms and determine how much was natural or related to roads, harvest or fire.

These measurements were then compared to model outputs and it was found that the model (1) closely predicted the proportion of landslides originating from undisturbed land versus managed land, (2) predicted the increase in landslide rates on disturbed land relative to undisturbed land, and (3) over-predicted total landslide sediment production by two to three times (de la Fuente et al. 2006). Because the GEO model appears to over-predict landslide sediment production, the risk ratios developed based on modeled sediment production will likely be very conservative.

Additional testing of the KNF CWE models (GEO and USLE), in partnership with the University of California, Berkley (Cover et. al. 2006) is beginning to quantify linkages between sediment supply, channel conditions, and the magnitude of biological response. Initial results suggest the sediment supply models successfully predict certain channel conditions (e.g., fine sediment stored in pools and riffles) in cobble-bed streams of moderate gradient in granitic watersheds with varying disturbance levels and these channel responses can be linked to direct biological responses.

GEO Assumptions and Limitations

1. Coefficients predict landslide production for a flood event with a recurrence interval of 10–20 years. It is assumed future storms will produce landslides at rates similar to past events.

2. Landslide sediment coefficients were developed in the Salmon River basin in the southern part of the Klamath Forest and modified by 1997 flood data. It is assumed that empirical relationships developed in one basin can be extrapolated to other basins.

3. Opening and then decommissioning of currently abandoned roads will reduce landslide risk.

4. Land begins to recover after 10 years following disturbance.

5. Thinning does not affect landslide sediment production (assumes zero increase).

ERA Modeling

The ERA (Equivalent Roaded Area) analysis is a mathematical model that expresses land disturbance in terms of a common variable, ERA. The ERA is a conceptual unit of measure used to assess ground disturbing activities. One acre of dirt road surface with good drainage equals one ERA. Numeric coefficients are used to convert acres of management activities such as timber harvest, construction of landings and mastication to ERAs. For example, 1 acre of mastication is equivalent to 0.03 ERA. In each watershed, disturbances are added together to determine the cumulative ERA for that watershed. To calculate the level of ground disturbance, acres of ground disturbing activities were converted to ERA values based on disturbance coefficients multiplied by the treatment area. Coefficients were applied to similar activities regardless of soil type, slope conditions, location in the watershed, or season of operation (USDA Forest Service 2007e).

ERA coefficients were developed by Elder and Laurent (pers. comm.) for use at the project scale. These coefficients were modified from the Jack/Gray EA (Kilgore and Power 1998) and use relative values from the *Klamath National Forest Cumulative Watershed Effects Analysis Handbook* (USDA Forest Service 1990) and from other literature sources. Coefficients were further modified in February 2002 in a meeting of timber project planners and CWE modelers (Elder and Reichert 2004).

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. This value can serve as an index to describe impacts to downstream water quality. An increase in the road density of a watershed can result in greater impacts to water quality downstream.

Higher ERA values indicate the potential for increased peak flows that are more erosive and can lead to decreased channel stability and higher sediment transport. Stream channels in poor condition tend to be more sensitive to increases in peak flow since they are frequently lacking an effective root mass to bind streambanks and large organic debris to trap and retain sediment in the system. These channels frequently incise so that greater flows are confined within the channel and unable to access the floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream (USDA Forest Service 2007e).

Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed tolerance to land use is called the Threshold of Concern (TOC). The TOC is an indicator used to assess the risk of CWEs. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability for each watershed. For example, a watershed with sensitive channels, highly productive anadromous streams (high beneficial use), highly erodible soils, high landslide densities and/or high percentage of granitic lands (slope stability), and high percentage of watershed in the "rain-on-snow" zone (~3,500' to 5,000' elevation; hydrologic response) would have a high "watershed sensitivity level" and therefore a low TOC.

TOC values for the analysis watersheds were taken from the KNF CWE Analysis (Elder and Reichert 2004). The TOC is expressed as a percentage of the watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for adverse cumulative effects are higher. The cumulative ERA in a watershed is expressed a risk ratio of ERA/TOC. As this risk ratio approaches 1.0, there is an increased loss of soil porosity and soil cover resulting in greater runoff potential and peak flows. Above 1.0, water quality may be degraded to the point where the water quality is no longer supports beneficial uses, such as adequate habitat for fisheries.

The TOC serves as a warning that adverse impacts may exist/occur within a given watershed, which may adversely impact peak flows, water quality, and/or channel stability. Values less than 1.0 indicate that the watershed is below its threshold, while values greater than 1.0 indicate that the watershed has exceeded its threshold. The TOC does not represent that exact point at which adverse impacts will occur. Rather it serves as a "yellow flag" indicator of increasing susceptibility for adverse cumulative effects occurring within a watershed (USDA Forest Service 2007e). Susceptibility of CWE generally increases from low to high as the level of land disturbing activities increase towards or past an ERA/TOC value of 1.0 (Elder 1998).

ERA Model Limitations

The ERA model has several recognized limitations, including:

1. Unlike the surface erosion (USLE) and mass wasting (GEO) models, the ERA model is not intended to be a process based sediment model. Rather, it is intended to provide an indicator of watershed conditions.

2. The model is not spatially explicit. As such, the effect of an activity does not vary with its location within the watershed.

3. Coefficients for recovery refer to recovery at the site of land use, but not to recovery from the off site impacts of that activity. For example, a logged area is considered recovered, even though sediment generated as a result of logging is still present in downstream channels.

4. The procedure requires calibration of many coefficients for each area. This calibration would ideally be based on lots of monitoring data for each activity. However, monitoring is expensive and time consuming, so the necessary coefficients are estimated based on best professional judgment.

ERA Model Assumptions

The ERA analysis for this project is based on the following assumptions.

1. The potential for CWEs increases with land use intensity
2. All of the proposed project impacts occur in the same year
3. County roads were assumed to have a width of 26 feet and state roads a width of 32 feet

3.4.1.2 Fish Habitat Indicators

The Fisheries Biological Assessment/Biological Evaluation (B. Thomas 2007b) analyzes eighteen watershed components. Three of those components (temperature, substrate embeddedness, and peak flow) were chosen for assessment of negative impacts from this project because they represent the components most likely to be affected by this type of project. Temperature and substrate embeddedness (settleable material) are objectives in the Basin Plan (WQCB 2007). Peak flow is a hydrologic condition that directly affects sediment delivery and channel condition.

Temperature

Vegetation treatment projects have the potential to affect stream shade, and therefore water temperature if treatments are located close to watercourses or remove too much vegetation. However, this project does not propose any activities that will reduce canopy within Riparian Reserves, reduce existing stream surface shading, or otherwise affect water temperatures; therefore, there will be no changes in water temperature.

There is no commercial thinning within the first site potential tree height (170') of Riparian Reserves adjacent to flowing or standing water. Canopy shade will not be affected by removal of trees <9" DBH and piling of material as part of fuels reduction. Hazard trees may be felled along roads in Riparian Reserves but will not affect stream temperature because removing few, scattered hazard trees will not affect canopy shade. Commercial thinning in the outer 170'–340' of Riparian Reserves will not affect canopy shade since trees located outside the first site potential tree height do not contribute to steam shade.

Substrate Embeddedness

Potential changes in substrate embeddedness are derived from interpretation of the USLE and GEO components of the cumulative watershed effects model. Percent of fines in gravel (USDA Forest Service 1995b, 3-68) can be used to assess existing embeddedness conditions when that information is available. When that information is unavailable, professional judgment (supplemented by USLE and GEO model outputs) is used to assess existing conditions and to estimate effects. For a full explanation of model interpretation regarding substrate embeddedness, see the Fisheries Biological Assessment/Biological Evaluation (B. Thomas 2007b).

Peak Flow

Potential changes in peak flows are derived from interpretation of the ERA component of the cumulative watershed effects model. See the Fisheries Biological Assessment/Biological Evaluation (B. Thomas 2007b) for more information on methodology.

The watershed reports (Snavely 2007a, 2008b) provide a detailed discussions of the affected environment, data collected, modeling process and results, and effects assessment related to hydrology. The soils report by Laurent (2008) provides supporting information on the affected environment and environmental effects for the soils resource as well as estimates of burn intensities and soil erosion after future wildfires. The fisheries reports by B. Thomas (2006, 2007a), and the Management Indicator Species Project Level Assessment by Johnson and B. Thomas (2006) provide detailed information on the affected environment, environmental effects for fisheries and aquatic habitats, and habitat indicators. These documents are incorporated by reference and available in the project file.

3.4.1.3 Wildfire Effects Modeling

Most of the Project Area has not experienced a wildfire in almost 100 years. With fire return intervals of 0–35 years in many stands (up to 100 years in others), it is expected that a wildfire will occur within this area in the foreseeable future. The Watershed Erosion Prediction Project (WEPP) was used to estimate soil and water impacts from such a wildfire. WEPP presents the probability of a given level of erosion occurring the year following a disturbance.

Assumptions and limitations of the model include:

1. Disturbed WEPP interface v. 2006.01.02 was used for this exercise.

2. The WEPP interface used local weather data (Fort Jones, CA) as a basis to simulate 30 years of climate.

3. The model allows use of a limited number of soil types, so values may not accurately reflect actual conditions. Therefore, model results should be used primarily to compare impacts between alternatives.

3.4.2 Affected Environment

The project is situated along the south side of the Siskiyou Crest, a broad east-west ridge of low to moderate steepness separating the Klamath River drainage from the Rogue River drainage. The 7th field watersheds extend from 3,200’ to 7,400’ elevation; the project lies below 6,000’. Most of the 40”–75” annual precipitation in the Project Area is snowfall with occasional rain on snow events below 5,500’. Summer precipitation in the form of highly localized rain and hail can be quite intense, although usually of short duration. Rain-on-snow and summer thunderstorms can trigger landslides and accelerate surface erosion.

Most of the Project Area was completely logged ca. 1900 by railroad and steam donkey methods. These methods involved considerable ground disturbance, and removal of most of the timber. The troughs formed by logs being yarded across the landscape are still visible throughout the Project Area. Most of these disturbances are now revegetated and support conifers up to 20" DBH. It is unknown how this logging affected water quality in Beaver Creek, but observations of hillslope disturbances indicate that a considerable amount of sandy sediment entered the stream system at that time. The area is now re-forested and is considered to be hydrologically recovered from this logging.

Hydraulic mining and hard rock mining also occurred around this same time period. One hydraulic mine on the west bank of Beaver Creek immediately west of the mouth of Hungry Creek was a few acres in size on a bench about 160 vertical feet above the creek. This mine likely delivered a large volume of sediment to Beaver Creek. Some of the area remains barren of vegetation, and the mine remains a minor sediment source. Hydraulic mining also occurred along much of the length of Grouse Creek, resulting in channel alterations.

The Project Area is now predominantly federally managed lands with small in-holdings of private ownership. The lower reaches of the large 5th field watershed contain checkerboard ownership of interspersed federal and private lands. Road density ranges from moderate to high, largely due to the presence of industrial timberlands and the history of timber harvest. Private lands have been used for farming, livestock grazing, and timber production.

The upper watersheds get a considerable amount of dispersed recreation, mainly sightseeing, off-highway vehicle use, camping and hunting during late summer and fall. Most of the recreation-associated watershed effects are from off-highway vehicles causing localized road erosion. While most use is on roads, some off-road enthusiasts will drive onto seasonal meadows, causing vegetation loss and soil compaction.

There is on-going road and trail maintenance in the analysis area. Trail maintenance in the analysis area is confined to the Pacific Crest National Scenic Trail. Road maintenance primarily occurs on main roads such as roads 40S16 and 41S09. These arterial routes require maintenance to keep water from concentrating at cross drains. Most Project Area road segments are stable, not overly wide, and do not have large fills, however a few unauthorized road segments are steep and quite rutted. At least three poorly drained, rutted roads have several stream crossings. Ridge top roads that do not involve stream crossings are a low risk for introducing sediment to the stream systems.

Livestock grazing occurs in two allotments. Cattle congregate along road segments between springs, meadows, and streamside riparian areas which may cause localized seasonal removal of riparian and meadow vegetative cover and localized trampling of stream channel banks.

3.4.2.1 Conditions in 7th Field Watersheds

All five 7th field watersheds have small amounts of private ownership interspersed with federal land. The privately owned sections of the 7th field watersheds are used mostly for timber production. Past disturbances include wildfire, timber harvest (with associated roads), mining, and flooding (most recently in 1997). Most stream channels in the Project Area are stable or in the process of stabilizing.

Deer-Beaver Creek

Road density averages 5.58 miles per square mile, which is considered high. Embeddedness is high with the average being over 50%, well above the desired level of 20% defined in the LRMP. The high levels of embeddedness are due to the large amounts of decomposed granitics present in the upper portions of this watershed. The mainstem channel banks are generally stable and well vegetated. The Riparian Reserves are well vegetated. Stream temperatures are considered to be properly functioning (defined as functioning within the system's capability [B. Thomas 2007a, app. D]) as a result of the healthy condition of the Riparian Reserves. Resident rainbow trout are present in Deer Creek; anadromous fish do not occur in Deer Creek due to natural barriers at the mouth that block anadromous fish access into this stream.

Upper Cow Creek

Road density averages 3.70 miles per square mile. Embeddedness is variable but averages >20%. The stream channel is in good condition and the channel banks are generally stable and well vegetated. Stream surveys in 1994 and 1999 found that stream temperatures in this watershed averaged 17°C (properly functioning). Upper Cow Creek contains Critical Habitat for Southern Oregon/Northern California Coasts coho salmon, Essential Fish Habitat for Upper Klamath-Trinity Rivers Chinook salmon and habitat for the Klamath Mountains Province steelhead trout and resident rainbow trout. No Chinook salmon are known to occupy Upper Cow Creek.

Long John Creek

Road density averages 4.92 miles per square mile, which is considered high. High levels of fines and embeddedness are present, primarily due to the large amounts of decomposed granitics present in the upper elevations of the watershed. The Riparian Reserves are stable and well vegetated. The mainstem channel banks are stable with little downcutting present. Stream surveys in 1994, 1999, and 2002 found that stream temperatures in this watershed averaged 15°C (properly functioning). Long John Creek contains Critical Habitat for Southern Oregon/Northern California Coasts coho salmon, Essential Fish Habitat for Upper Klamath-Trinity Rivers Chinook salmon and habitat for the Klamath Mountains Province steelhead trout and resident rainbow trout. No Chinook salmon are known to occupy Long John Creek.

Beaver-Grouse Creek

Road density averages 4.50 miles per square mile, which is considered high. This watershed is still recovering from the 1997 flood and from a debris flow that occurred during an intense summer thunderstorm in 1989. These events transported large amounts of sediment and decomposed granitics down the stream channels from the upper elevations of the watershed. In spite of these recent events, the stream channel and banks are stable. Embeddedness is high (averaging 50%) and not in equilibrium with the watershed's ability to transport sediment through the system. Stream surveys in 1999 and 2002 found that stream temperatures averaged 17°C (properly functioning). Beaver-Grouse Creek contains Critical Habitat for Southern Oregon/Northern California Coasts coho salmon, Essential Fish Habitat for Upper Klamath-Trinity Rivers Chinook salmon and habitat for the Klamath Mountains Province steelhead trout and resident rainbow trout. No Chinook salmon are known to occupy Beaver-Grouse Creek.

Headwaters Cottonwood Creek

Road density averages 3.01 miles per square mile. Embeddedness is moderate to high. The lower reaches are low gradient channels with robust riparian vegetation. Stream surveys in 2004 found that stream temperatures averaged 15°C (properly functioning) due to the high elevation of the headwater streams in this 7th field watershed and the healthy condition of the Riparian Reserves.

3.4.2.2 Conditions in Beaver 5th Field Watershed

The lower portion of the Beaver Creek watershed is primarily "checkerboard" ownership. The privately owned sections are used mostly for ranching and farming. Some timber harvest occurred on National Forest Lands in the upper watershed in the 1980s. Road density is moderate to high, averaging over 4 miles per square mile. This watershed is still recovering from the 1997 flood. The mainstem channel banks are generally stable and well vegetated.

Anadromous fish live in the mainstem of Beaver Creek and the lower reaches of Grouse, Cow and Long John Creeks. Resident rainbow trout, winter-run steelhead trout, fall Chinook, and coho salmon spawn and rear in Beaver Creek about one mile downstream from the Project Area. The distance from occupied critical habitat and essential fish habitat to proposed treatment units ranges from 0.1 to 2.7 miles. The distance from resident rainbow trout habitat to proposed treatment units ranges from 0.1 to 1.9 miles.

Stream surveys in 1999 and 2002 found stream temperatures in the upper portions of this watershed are properly functioning, ranging from 16.7°C to 17.3 °C. Temperatures are higher (average 23 °C) in the lower portions of the watershed due to sparse riparian vegetation along the stream channel.

Channel bank and instream conditions do not indicate high stream channel erosion rates. The fine silt and coarse decomposed granitic sand found in many low gradient sections of the lower stream reaches indicate that suspended sediment has been high in recent years. Beaver Creek averaged 37% embeddedness in 2002, which is within the stream's ability to transport sediment though the system.

3.4.2.3 Water Quality Objectives

Water quality objectives are outlined in the Basin Plan (WQCB 2007). The primary purpose for maintaining water quality is to assure that the beneficial uses of water are not adversely affected.

For management actions on National Forest System Lands, the USFS Pacific Southwest Region (R5) entered into a 1981 management agency agreement with the WQCB and State of California requiring the USFS to institute a water quality management program to meet applicable water quality objectives and protect beneficial uses. Under the agreement, implementation of State-approved and Environmental Protection Agency (EPA)-certified BMPs is considered sufficient to protect water quality.

The role BMPs play in meeting the CWA and State water quality standards has been described by EPA in a guidance document titled SAM-32 (1987). This guidance established the policy that BMPs are the primary method for controlling non-point pollution (e.g. Forest management activities) and achieving water quality standards. In part, it says:

> Once BMPs have been approved by the State, the BMPs become the primary mechanism for meeting water quality standards. Proper installation, operation and maintenance of State approved BMPs are presumed to meet a landowner's or manager's obligation for compliance with applicable water quality standards…Applicable water quality standards along with water quality monitoring should be used to measure the effectiveness of BMPs. (SAM-32 1987).

3.4.2.4 Beneficial Uses

The primary purpose for maintaining water quality is to assure that the beneficial uses of water are not adversely affected. Beneficial uses include domestic and irrigation water, fish habitat, and recreational opportunities. There are two ditches currently in use for irrigation in Beaver Creek downstream of the Project Area, and there may be additional undocumented surface water intakes in

the lower reaches. Recreational opportunities focus on fishing and swimming. Anadromous and resident fish are discussed above.

3.4.2.5 Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) contained within the NWFP ROD was intended to "restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands" (USDA Forest Service and USDI Bureau of Land Management 1994b, B-9, 1994a). The ACS strives to maintain and restore ecosystem health at watershed and landscape scales. Compliance with the ACS means that agencies manage the riparian-dependent resources to maintain the existing condition, or implement actions to restore conditions.

3.4.2.6 Areas With Watershed Concerns

The LRMP ROD (USDA Forest Service 1995c, 3 and 15) identified Areas With Watershed Concerns (AWWCs). This classification indicates watersheds that require additional analysis due to cumulative watershed effects concerns which include any combination of high disturbance levels, high potential for landslides or surface erosion, and poor aquatic habitat conditions. Direction for managing AWWCs consists of completing a watershed analysis prior to ground-disturbing activities, and taking a cautious approach to management, particularly with regard to timber harvesting and road construction activities. Portions of the Beaver and Cottonwood 5th field watersheds were identified as AWWCs.

The KNF Supervisor's letter of direction (Boland 2006) clarified the meaning of "cautious approach" by identifying the circumstances under which management activities can proceed. That memo determined that a cautious approach involves activities that (1) do not retard attainment of desired future conditions identified in the LRMP; (2) are carried out in support of forest health objectives; and (3) result in a long-term benefit to the environment (Boland 2006).

3.4.3 Environmental Consequences

Direct effects from the project that will influence aquatic resources include removal of vegetation, exposure of soil to the elements (such as wind and rain), soil displacement, soil compaction, and pumping of water from the stream at drafting sites.

Indirect effects occur later in time or at another location. Indirect effects from the project may include accelerated soil loss over time, change in erosion patterns, sedimentation of streams, and changes in soil productivity.

Aquatic resources may be seriously impacted by high severity wildfire. Wildfire effects include removal of vegetation, exposure of mineral soil, soil heating with a resultant loss of porosity, and duff consumption. These conditions can contribute to soil displacement and sedimentation of streams. Wildfire effects are discussed separately by alternative.

Cumulative watershed effects are the result of natural disturbances, such as wildfire, natural landslides and channel erosion during flood events, combined with the effects from past, present, and reasonably foreseeable management activities. Cumulative watershed effects include increases in erosion rates, increased sedimentation (affecting embeddedness), and higher peak flows (resulting in channel widening or downcutting, and exposure of sediment sources).

Design features applicable to the action alternatives include BMPs, Wet Weather Operation Standards (USDA Forest Service 2002a), and the Forest-wide soil cover Standards and Guidelines, discussed in Chapter 2 and Appendix D. Application of these measures will help to minimize the environmental effects of each action alternative.

3.4.3.1 Alternative 1

Direct and Indirect Effects

Past disturbances considered in this analysis include wildfire, timber harvest (with associated roads), mining, and flooding (most recently in 1997). With no proposed activities, Alternative 1 will not cause any ground disturbance. Road conditions and densities will remain the same. Watershed and stream conditions and fish habitat will not change in the short term, and over time will change only in response to climate and natural disturbance processes. Aquatic habitat will continue to recover, unless set back by natural processes.

Wildfire Effects

Alternative 1 does nothing to reduce wildfire-induced tree mortality. A large wildfire occurring in the Project Area will burn in a mosaic of high and moderate burn severities. Due to high fuel loads, it is expected that a majority of the vegetation in the area would burn at high severity (Wright 2007). High severity fire removes overstory vegetation, soil cover and duff. Soil is exposed to rain and wind.

Soil burn severity data on the Klamath National Forest from 1977–2002 indicates that a future wildfire would burn with approximately 9% high soil burn severity throughout the fire perimeter, 22% moderate soil burn severity, and 69% low and unburned soil burn severity (Snavely 2005). Intense soil heating commonly results in water repellency (loss of soil infiltration). In a worst case

scenario, all of the high and moderate severity burned soils would become water repellent, causing more rapid runoff and a higher percent of precipitation running off instead of infiltrating the soil.

Over time, significant canopy loss and reduced soil infiltration can increase erosion and runoff rates, with a resultant rise in sedimentation. Loss of streamside canopy can reduce shade, which will affect water temperature. Total loss of canopy leads to loss of tree root strength after a few years. On steep or unstable slopes, loss of root strength and increased runoff rates can increase the risk of landslides. As roots decay from a wildfire event, until regeneration is established, there is a period of vulnerability to landsliding for about 10 years starting from 5 years after the fire (USDA Forest Service 1989).

Loss of riparian vegetation and increased runoff can lead to increased peak flow. This in turn can increase the risk of destabilizing streamside landslides during certain types of storms. Rill erosion (erosion from small streams occurring immediately after rain) would exacerbate this by efficiently conveying water down slopes that have lost woody material which normally checks flow velocity.

Cumulative Effects

Alternative 1 represents the current condition of the watershed. The cumulative effects analysis includes the effects of all past and present activities and occurrences. No management activities are assumed to occur in the future.

Cumulative Effects Model Outputs

7th Field Watersheds

The current situation was analyzed for each 7th field watershed separately. Calculated model outputs are shown in Table 3-22. Model outputs do not include potential future wildfires.

Table 3-22 Risk Ratios For Current Conditions at the 7th Field Watershed Scale

Model	Deer-Beaver	Upper Cow	Long John	Beaver-Grouse	Headwaters Cottonwood
USLE	0.93	0.66	0.88	0.94	0.41
GEO	0.87	0.49	1.42	1.47	0.86
ERA	0.69	0.31	0.38	0.53	0.26

Surface Erosion (USLE): None of the five 7th field watersheds have risk ratios in excess of 1.0 and therefore are not considered at risk for changes in watershed conditions related to surface erosion for the first year. Alternative 1 will not change current conditions unless a wildfire occurs in the area.

Landslides (GEO): Two of the five 7th field watershed landslide sediment ratios are in excess of 1.0, so the risk of additional sediment from landslides is considered to be high. Alternative 1 will not change current conditions.

ERA: All five 7th field watersheds currently have risk ratios well below 1.0 and therefore are not considered at risk for changes in stream flows from future disturbances. Alternative 1 will not change current conditions.

5th Field Watershed

The current situation includes the additive effects from all past and present activities occurring within all thirteen 7th field watersheds that drain into the 5th field Beaver watershed, including those in which no project activities are proposed. Calculated model outputs are shown in Table 3-23.

Table 3-23 Risk Ratios For Current Conditions at the Beaver 5th Field Watershed Scale

Model	Beaver
USLE	1.17
GEO	0.91
ERA	0.70

Surface Erosion (USLE): The current risk ratio in Beaver Creek exceeds 1.0, which means that there is an increased risk adverse effects may be expressed on the landscape. This risk is due primarily to roads and extensive land disturbance on privately-owned lands. Alternative 1 will not change the current condition.

Landslides (GEO): The current landslide sediment ratio for Beaver Creek is less than 1.0. Cumulative watershed effects are not likely to be expressed on the landscape. Alternative 1 will not change the current condition.

ERA: The current risk ratio is less than 1.0 and therefore the Beaver 5th field watersheds is not considered at risk for changes in stream flows from present or future modeled disturbances. Alternative 1 will not change current conditions.

Effects to Anadromous Fish Habitat

The No Action Alternative will not change the current situation. Current levels of road-related erosion will decline slowly over time as roadbeds stabilize through revegetation. Road densities and hydrological connections of roads to streams will not change.

Temperature

Under this alternative, no riparian vegetation will be removed or affected. There will be no impacts to current conditions in either watershed.

Substrate Embeddedness

Historic watershed disturbance levels have led to the current high levels of substrate embeddedness in Beaver Creek. Under this alternative, embeddedness levels will slowly decline over time as watershed recovery progresses, unless new sediment sources are introduced.

Peak Flows

This alternative does not affect peak flow, except in the case of wildfire, as described below.

Wildfire Effects

A large wildfire occurring in the project would have a high potential for crown kill and torching of trees. Most of the vegetation (95%–100%) in most stands would be killed. WEPP modeling indicated that a high severity fire in Grouse Creek would result in a 99.9% increase in erosion over current conditions across all affected acres. Sediment delivery to the stream would increase by 80%, as vegetation in the Riparian Reserves would be reduced or eliminated. The same high severity fire in Long John Creek would increase erosion 97.6% over current conditions. The CWE models were applied to this hypothetical scenario, and USLE risk ratios were well over 1.0 (Bousfield et al. 2008). This would greatly increase the likelihood that cumulative watershed effects would be expressed on the landscape.

Surface erosion from existing disturbed areas such as existing skid trails and landings would be higher than undisturbed areas after a wildfire due to compaction and channeling of runoff. However, the amount of increased erosion from these sites after a wildfire would be very minor when compared to the amount of wildfire-caused accelerated erosion across the landscape.

Post-fire conditions can lead to increased peak flows. A large increase in peak flow can trigger destabilizing streamside landslides during certain types of storms. Particularly, high intensity, short duration events, such as summer thunderstorms. These effects would most likely be noticeable in Beaver-Grouse Creek and Long John Creek, which currently have GEO ratings above 1.0.

Removal of streamside shade by stand-replacing fire, and reduction in pool depth due to sedimentation from burned areas, could adversely affect water temperatures. Increased erosion following a stand-replacing wildfire could change the current occasional brief periods of sedimentation and turbidity to prolonged chronic periods. Prolonged periods of chronic sedimentation will increase embeddedness, thereby reducing the quality of spawning habitat, and

adversely affecting the quality of juvenile rearing habitat and adult holding habitat. This would potentially affect 9.5 miles of coho salmon, Chinook salmon and steelhead habitat, and 18.4 miles of resident rainbow trout habitat.

Effects on Water Quality for Beneficial Uses

Water quality will remain at current levels unless the area sustains a stand-replacing fire, landslide, or other natural event which introduces sediment into the channel. Such an event could remove vegetation that shades the creek, which could adversely affect water temperature. The most likely result would be the movement of sediment into stream channels. Sediment could affect fish by filling pools (reducing the quality of pool habitat), reducing the availability of food, and filling space in spawning gravels, reducing survival of fish eggs. Depending on circumstances, this sediment could affect stream conditions for days or years. Sediment could also impact the effectiveness of surface intakes for domestic or agricultural water. Recreation would be affected by reduced numbers of fish, and/or changes in swimming holes. In the absence of such an event, beneficial uses will not be affected. This alternative is consistent with Basin Plan direction, and State and Federal water quality laws.

Consistency with Aquatic Conservation Strategy

No ground disturbance will occur under this alternative; any changes in watershed conditions will be in response to natural processes, including wildfire. This alternative does not address any of the nine ACS objectives.

Areas With Watershed Concerns

Under this alternative, there will be no impacts to the AWWC.

3.4.3.2 Effects of the Action Alternatives

Direct and Indirect Effects of all Action Alternatives

All the action alternatives propose habitat restoration thinning, fuels reduction treatments, and related activities. The direct and indirect effects from these activities are similar for each alternative, and are discussed together here. The direct and indirect effects of each alternative are analyzed in the cumulative effects section.

Landings

Landing construction removes vegetation and displaces and compacts the soil. Indirect effects on watershed condition can include erosion of soil from disturbed areas, and deposition of sediment into stream channels. It is estimated that approximately 40 new landings, totaling about 25 acres, and

seven existing landings will be needed for Alternative 2. Other action alternatives affect less total acreage through landing construction (see Table 2-6) New landings will be constructed using project design features (listed in Chapter 2) to mitigate effects to soils. The design features include locating landings outside of Riparian Reserves, so that they are at least 170' away from watercourses. Post-project actions include mulching (covering the soil with organic material to replace lost vegetative cover). These measures are considered sufficient to keep soil from leaving the landings. If for some reason any soil does move off the landing, the filtering capacity of the Riparian Reserves will prevent it from reaching stream channels. No additional erosion or sedimentation is expected from new or existing landings due to the use of BMPs and conservation measures.

Road Actions

Road improvement and decommissioning actions can result in short-term soil displacement and erosion of soil into streams. Over time, these actions can also reduce chronic sediment input to nearby channels and prevent development of new sediment sources. Temporary spur roads result in short-term loss of vegetative cover, soil displacement and compaction. With the exception of two short spurs in Alternatives 2 and 4, no temporary road construction will occur in Riparian Reserves. Maintenance of existing roads can displace soil but generally improves drainage and reduces erosion hazards.

Roads will be constructed, improved and decommissioned using project design features and BMPs (listed in Chapter 2 and Appendix D) to mitigate effects. Design features such as using smaller fill volumes and larger fill material, mulching of bare soil, subsoiling, and drainage control will minimize the effects of road management activities. Short term use of temporary roads (construct and close within one season) will reduce the amount of time soils are exposed to the elements. Use of BMPs should ensure that soil does not leave the road prism. In the event soil does leave the road prism, it would be intercepted by Riparian Reserves.

All the alternatives would decommission about 0.5 miles of system road. The amount of unauthorized road that would be used and then closed ranges from 4.5–8 miles. Alternative 2 proposes 6.9 miles of temporary roads, Alternative 4 proposes 4.96 miles, Alternative 5 proposes 2.27 miles and the Preferred Alternative proposes 1.7 miles. Alternatives 2 and 4 propose construction of two temporary roads within Riparian Reserves, affecting about 0.3 acre. The effects of this construction are included in the cumulative effects analysis. No temporary roads are proposed within Riparian Reserves under Alternative 5 or the Preferred Alternative.

Water Drafting

Water drafting involves physical removal of water from a stream using a pump. Drafting can directly affect fish that are present at the drafting site through disturbance or impingement onto the hose screen. Intermittent reductions in stream flow (up to 10%) during drafting could cause short-term

reductions in holding and rearing habitat. This disturbance will stop when drafting is completed. Five water drafting sites, one in Beaver Creek, one in Cow Creek, one in Long John Creek, one in Grouse Creek, and one in an unnamed tributary to Grouse Creek, are expected to be used during the project. Two of the drafting sites (Beaver Creek and Cow Creek) are located in streams containing anadromous fish; all sites may affect resident rainbow trout. Use of project design features (screening intakes and restricting pumping rates) will minimize the effects of this action on fish. No fish are expected to be killed by this action.

Ground-based Yarding

Ground-based mechanical yarding will compact soils from repeated passes of track or rubber-tired skidders on existing and new skid trails and temporary roads. No timber harvest is proposed within the first 170' of Riparian Reserves. Applicable design features and BMPs include reusing existing skid trails, restricting equipment to slopes <35%, and subsoiling or waterbarring skid trails after use. These practices will reduce the amount of compacted area and minimize soil displacement. Recent monitoring of skid trails on the Forest determined that waterbars were effective in controlling erosion and preventing sediment from reaching streams (USDA Forest Service 2006c). Soil that leaves skid trails is unlikely to reach streams due to the filtering capacity of Riparian Reserves. Potential impacts are considered in the cumulative effects modeling.

There are 1,202 acres of ground-based yarding proposed in Alternative 2, 965 acres in Alternative 4, 1,065 acres in Alternative 5, and 1,032 acres in the Preferred Alternative.

Skyline Yarding

Skyline yarding removes vegetative cover and displaces soil in the yarding corridors. Indirect impacts would occur if soil was to reach streamcourses; however, it is expected that any soil that moves out of a corridor would be intercepted by forest ground cover and Riparian Reserves before it could enter the stream channel. Project design features include waterbarring of cable corridors, scattering of logging slash which has been shown to be an effective method to control erosion and retain soil cover (USDA Forest Service 2006c). BMPs, including requiring full suspension over Riparian Reserves and mulching of cable corridors, will be utilized to minimize the potential for soil erosion.

There are 1,602 acres of skyline yarding proposed in Alternative 2, 1,528 acres in Alternative 4, 1,471 acres in Alternative 5, and 1,610 acres in the Preferred Alternative.

Helicopter Yarding

A small amount of soil compaction and displacement occurs during helicopter yarding. The amount of soil displaced is not measurable and will not affect aquatic resources.

Machine Mastication

Soil displacement from mastication is limited to sites where the machine turns. The amount of displaced soil is not quantifiable and will not impact aquatic resources.

Thinning

Thinning removes overstory vegetation but does not affect soil cover. A small amount of soil compaction occurs when trees are felled. The amount of compaction is not quantifiable and will not impact aquatic resources.

Hand Piling and Pile Burning

Hand piling and pile burning affect vegetation immediately below the pile. Generally these sites retain a layer of ash after burning and experience revegetation fairly quickly. These activities do not affect aquatic resources.

Underburning

Underburning removes some vegetative cover, which is generally a short-term impact when low intensity fire is used and soil cover requirements are met. Erosion of burned sites could affect aquatic resources if soil is carried into streams. Underburning will be initiated outside of Riparian Reserves, though fire may be allowed to back down into Riparian Reserves from ignition points higher on the hillslopes. It is unlikely that this activity will affect aquatic resources due to maintenance of soil cover and the filtering capacity of Riparian Reserves.

Road Density Reduction

Short-term impacts of decommissioning were discussed under Road Actions. This action will disconnect ditches from streams, resulting in reduced runoff peaks, channel erosion, and sediment delivery to streams in the long term. All action alternatives will decommission 7.92 miles of road.

Alternative 2: Cumulative Effects

CWE Model Outputs

7th Field Watersheds

Table 3-24 displays the change in risk ratio in each 7th field watershed for each component of the Cumulative Watershed Effects model for Alternative 2 compared to Alternative 1.

Table 3-24 Change in Risk Ratios by Watershed and Model Indicator for Alternative 2

Model	Change/ Risk Ratio	Deer-Beaver	Upper Cow	Long John	Beaver-Grouse	Headwaters Cottonwood
USLE	Change	+0.03	+0.01	+0.09	+0.04	0
	Risk Ratio	0.96	0.67	0.97	0.98	0.41
GEO	Change	+0.01	0	-0.05	-0.02	0
	Risk Ratio	0.88	0.49	1.37	1.45	0.86
ERA	Change	+0.14	+0.03	+0.36	+0.25	+0.06
	Risk Ratio	0.83	0.34	0.74	0.78	0.32

Surface Erosion (USLE): The model shows very small increases in the surface erosion risk ratios for each of the watersheds due to exposed or displaced soil. In every case, risk ratios will remain below 1.0. It should be noted that this is an increase in risk, and does not imply a certainty of effects. The risk applies only to the first year following project completion. Should erosion occur, the small amount of soil that moves will not be measurable at any one site. Any soil that moves off disturbed sites will not enter stream channels because it will be intercepted by the 170' undisturbed Riparian Reserves. Effects to aquatic resources are considered to be negligible.

Landslides (GEO): Two watersheds (Long John and Beaver-Grouse) currently show GEO risk ratios above 1.0. Modeling of post-project conditions indicate that both of these risk ratios will be reduced. Risk ratios either decrease slightly or remain at pre-project levels for the other watersheds. Effects are considered to be neutral.

Disturbance Index (ERA): All watersheds show an increase in risk ratio under this alternative, although all remain below 1.0. Timber harvest and the construction of landings increased the ERA value in all of the watersheds, while road decommissioning and storm proofing helped offset those increases. This is an increase in risk, and does not imply that effects will automatically occur. However, if they should occur, the increase of risk in Headwaters Cottonwood Creek and Upper Cow Creek is so small that effects would not be measurable. An increase in peak flow could cause some bank and channel erosion, resulting in a short-term pulse of sediment from the decomposed granitics high in the Long John and Beaver-Grouse watersheds. The channels in these watersheds are all stable and resilient, with robust riparian vegetation that will provide some resistance to erosive forces. Effects on water quality are considered to be negligible.

5th Field Watersheds

The model shows no change in any of the indicators. This is due to the relatively small contribution of effects from the proposed activities in the Beaver 5th field watershed.

Wildfire Effects

A wildfire under Alternative 2 would have less severe effects than under the No Action Alternative. Mortality would be reduced under both moderate and extreme burning conditions. Tree survival would be 50%–60% higher in some stands. Fire would more likely stay on the ground, reducing severity. Retention of ground cover would minimize effects to soils.

Effects on Aquatic Habitat

7th Field Watersheds

Alternative 2 will slightly increase the risk of sediment entering the stream from ground-disturbing activities for the first year following project completion. Road decommissioning activities will increase risk of sediment delivery somewhat in the short term, but that risk is reduced in the long term. Risk is also reduced from improved road maintenance in the short and long term.

Temperature: This alternative does not affect stream temperature as no vegetation will be removed within the Riparian Reserves.

There is no commercial thinning within the first site potential tree height (170') of Riparian Reserves adjacent to flowing or standing water. Canopy shade will not be affected by removal of trees <9" DBH and piling of material as part of fuels reduction. Hazard trees may be felled along roads in Riparian Reserves but will not affect stream temperature because removing few, scattered hazard trees will not affect canopy shade. Commercial thinning in the outer 170'–340' of Riparian Reserves will not affect canopy shade since trees located outside the first site potential tree height do not contribute to steam shade.

Embeddedness: The small modeled increases in surface sediment risk (USLE) in each of the watersheds suggest an incremental increase in erosion, but no sediment is expected to reach stream channels because of buffering capacity of the Riparian Reserves so embeddedness will not be affected. The ERA values indicate a risk of sediment being generated by peak flow increases in Long John and Beaver-Grouse Creeks. A short-term pulse of sediment from the decomposed granitics in these watersheds could adversely affect embeddedness levels. The modeled risk is low, and the effects of an increase in peak flow would be moderated by the stability of the channels and the presence of riparian vegetation. Effects on fish habitat are considered to be insignificant.

Peak Flow: An increase in peak flow could cause some bank and channel erosion, resulting in a short-term pulse of sediment from the decomposed granitics high in the Long John and Beaver-Grouse watersheds. Such a pulse could affect fish habitat by adding sediment to pools (reducing the quality of pool habitat), reducing the availability of food, and filling space in spawning gravels

(reducing survival of fish eggs). Grouse and Long John Creeks have large amounts of decomposed granitics in the headwaters and are more vulnerable to this type of effect.

The risk of increased peak flow in these streams is small, and the extent of impacts to fish depends on the timing and location of any failures. Based on field review and analysis of the effects related to timber harvest and roads, a change in peak flow will be undetectable at either the 5th or 7th field scales and is unlikely to affect anadromous or resident fish or their habitat. The reduction in wildfire severity will be a long term beneficial effect to the watersheds.

5th Field Watersheds

The model shows no changes in any of the indicators. This is due to the relatively small contribution of effects from the proposed activities in the Beaver 5th field watershed.

Effect on Water Quality for Other Beneficial Uses

Increases in risk ratios are generally small, and should impacts occur, it is unlikely that they could be measured on the ground. With two exceptions, none of the risk indicators are above 1.0. The two watersheds that currently have a high risk of landslides show improvement after the project, primarily due to road decommissioning.

Overall, this project will reduce the risk of sediment and landslides, and improve conditions throughout the Project Area. Long-term benefits from fuel treatment include a reduction in the risk of high severity fire and its attendant impacts. At the 5th field watershed scale, effects of the project are diluted by water quality conditions in the larger contributing watersheds in lower Beaver Creek.

All beneficial uses will be maintained in the long term. This alternative is consistent with Basin Plan direction, and State and Federal water quality laws.

Consistency with Aquatic Conservation Strategy

Some activities are planned within the Riparian Reserves. Two temporary spur roads are proposed within Riparian Reserves, five water drafting sites have been identified within Riparian Reserves, ground fires would be allowed to back burn into Riparian Reserves, and some skyline corridors and skid trails may impact Riparian Reserves.

The LRMP contains the objectives for the Aquatic Conservation Strategy (ACS) as recommended by the NWFP ROD (USDA Forest Service and USDI Bureau of Land Management 1994a). The ACS objectives are found on pp. 4-6 and 4-7 of the LRMP (USDA Forest Service 1995a). Alternative 2 is consistent with the ACS objectives due to the implementation of Conservation Measures and Standards and Guidelines (refer to Chapter 2) to maintain water quality, retain large trees and snags, and to retain coarse woody debris. Riparian Reserves are intact and functioning; None of the action

alternatives will significantly affect Riparian Reserves, thus their sediment filtering and stream buffering capacity will be fully retained (B. Thomas 2007a). There will be no significant changes to stream temperatures or flow and sediment regimes—the primary processes affecting the ACS objectives (B. Thomas and Snavely 2007). By maintaining habitat conditions in the long term and minimizing direct impacts, there should be no change to aquatic biota within the Project Area (ibid). Project objectives to reduce fuels and promote development of late-successional forest are consistent with Riparian Reserve and ACS objectives. Reducing the risk and severity of wildland fire will benefit Riparian Reserves and water quality over the long-term. Consistency with each of the nine ACS objectives is documented in the Mt. Ashland LSR Project Aquatic Conservation Strategy Report (B. Thomas and Snavely 2007).

Areas with Watershed Concerns

Alternative 2 follows the *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b) recommendations to reduce road density and reduce fuels. Fuel reduction and improvement of stand health, especially in the lower units, will moderate the effects of wildfire. The slight modeled increases in risk of sedimentation will likely not be great enough to be measurable in the field. Effects from peak flows will be moderated by stable channel conditions and robust riparian vegetation in all the affected watersheds. All action alternatives reduce landslide risk in the two watersheds that currently have the highest risk ratios and do not change risk levels of the other watersheds which currently have risk ratios under 1.0. Road improvements and decommissioning actions will provide long term benefits to the watershed. Alternative 2 improves forest health, results in a long-term benefit to the environment, and does not retard attainment of desired future conditions identified in the LRMP. This alternative is consistent with management direction for AWWCs.

Wildfire Effects

The WEPP model was used to model soil loss, chance of erosion, and chance of sediment delivery. The slope profiles used to model sediment loss were located in the Grouse Creek and Long John Creek watersheds. The area profiled was scheduled for treatment in all action alternatives. The WEPP model is known to overestimate erosion and sediment delivery. The estimated sediment delivery from the WEPP model is best used as a comparative tool among alternatives rather than as an absolute number or estimate of sediment that would be delivered.

The results of the WEPP model indicate that, with adoption of project design features, the soil delivered to streamcourses would be about 4.6% beyond background, which is probably not measurable in the field at the 7th field watershed scale. Table 3-25 indicates that project actions would result in some degree of soil loss under a 30-year climate average; under a wildfire scenario, the No Action Alternative would result in 18 times more soil loss that the action alternatives with wildfire. The WEPP model assumes that all soil mobilized will be delivered to a watercourse. The project conservation measures will mitigate this to a certain degree. The primary mitigation is the

filtration and buffering provided by Riparian Reserve boundaries. Chance of sediment delivery is modeled to be about the same for the No Action and action alternatives; however, the model indicates that under a wildfire scenario, the No Action Alternative would result in a three times higher chance of sediment delivery to streams.

Table 3-25 WEPP Model Results

	No Action	No Action With Wildfire	All Action Alternatives	All Action Alternatives With Wildfire
30 Year Average Soil Loss	0.0089 tons/acre	1.26 tons/acre	0.031 tons/acre	0.067 tons/acre
2 Year Storm Soil Loss	0 tons/acre	0 tons/acre	0 tons/acre	0 tons/acre
Chance of Erosion	7%	97%	13%	20%
Chance of Sedment Delivery	13%	60%	13%	20%

As shown in Table 3-25, there could be approximately twice the chance of soil erosion stemming from project actions as compared to the no action (7% versus 13%). Were a wildfire to occur in the area, there would be a five-fold increase in the chance of erosion under the no action alternative as compared to the action alternatives. Under the action alternatives, fuels reduction work would limit high intensity fire and, subsequently, damage to vegetation in Riparian Reserves (Boyer et al. 2002). With adoption of the no action alternative for the proposed project, and an ensuing wildfire, the model indicates a massive increase in mobilized sediment (erosion) approaching levels 140-fold increase over background levels.

Alternative 4: Cumulative Effects

CWE Model Outputs

7th Field Watersheds

Table 3-26 displays the change in risk ratio in each 7th field watershed for each component of the Cumulative Watershed Effects model for Alternative 4 compared to Alternative 1.

Table 3-26 Change in Risk Ratios by Watershed and Model Indicator for Alternative 4

Model	Change/ Risk Ratio	Deer-Beaver	Upper Cow	Long John	Beaver-Grouse	Headwaters Cottonwood
USLE	Change	+0.03	+0.01	+0.09	+0.05	0
	Risk Ratio	0.96	0.67	0.97	0.99	0.41
GEO	Change	+0.01	0	-0.03	-0.01	0
	Risk Ratio	0.88	0.49	1.39	1.46	0.86
ERA	Change	+0.14	+0.02	+0.30	+0.21	+0.06
	Risk Ratio	0.83	0.33	0.68	0.74	0.32

Surface Erosion: Risk ratios are the same for all watersheds as in Alternative 2. Effects are considered to be identical to that alternative.

Landslides: Risk ratios are the same for all watersheds as in Alternative 2. Effects are considered to be identical to that alternative.

ERA: All watersheds show an increase in risk ratio under this alternative, although all remain below 1.0. Changes in risk ratios are similar to Alternative 2, although effects are reduced in Long John and Beaver-Grouse. Effects are considered to be generally the same as under Alternative 2.

5th Field Watersheds

Risk ratios for the Beaver Creek 5th field watershed are identical to those for Alternative 2.

Wildfire Effects

In the event of a wildfire, Alternative 4 will reduce burn severities from the current condition. The effects will be similar to those described under Alternative 2. Please see Table 3-25.

Effects on Aquatic Habitat

Alternative 4 will slightly increase the risk of sediment delivery to the streams from ground-disturbing activities. Road decommissioning activities will increase sediment risk of increased sediment to streams somewhat in the short term, but that risk is reduced in the long term. Risk is also reduced from improved maintenance in the short and long term. The risks of cumulative effects from high severity wildfire are similar to those from Alternative 2.

7th Field Watersheds

Alternative 4 will slightly increase the risk of sediment showing up in the stream from ground-disturbing activities for the first year following project completion. Road decommissioning activities will increase risk somewhat in the short term, but risk is reduced in the long term. Risk is also reduced from improved road maintenance in the short and long term.

Temperature: This alternative does not affect stream temperature since no vegetation removal is planned within the Riparian Reserves.

Embeddedness: Modeled increases in USLE and ERA are similar but slightly lower than those in Alternative 2. Effects are expected to be similar.

Peak Flow: The effects are similar to Alternative 2 with a slightly reduced risk of peak flows and related channel effects in Long John Creek and Grouse Creek.

Effect on Water Quality for Other Beneficial Uses

Effects are the same as for Alternative 2. All beneficial uses will be maintained in the long term. This alternative is consistent with Basin Plan direction, and State and Federal water quality laws.

Consistency with Aquatic Conservation Strategy

Effects are the same as for Alternative 2. Please refer to discussion on p. 3-149 for a discussion of ACS consistency.

Areas with Watershed Concerns

Alternative 4 is consistent with Forest guidance for AWWCs. Effects are the same as for Alternative 2. Please refer to discussion on p. 3-150.

Alternative 5: Cumulative Effects

CWE Model Outputs

7th Field Watersheds

Table 3-27 displays the change in risk ratio in each 7th field watershed for each component of the Cumulative Watershed Effects model for Alternative 5 compared to Alternative 1.

Table 3-27 Change in Risk Ratios by Watershed and Model Indicator for Alternative 5

Model	Change/ Risk Ratio	Deer-Beaver	Upper Cow	Long John	Beaver-Grouse	Headwaters Cottonwood
USLE	Change	+0.03	0	+0.08	+0.05	+0.01
	Risk Ratio	0.96	0.66	0.96	0.99	0.42
GEO	Change	+0.01	0	-0.05	-0.01	0
	Risk Ratio	0.88	0.49	1.37	1.46	0.86
ERA	Change	+0.13	+0.02	+0.35	+0.23	+0.06
	Risk Ratio	0.82	0.33	0.73	0.76	0.32

Surface Erosion: Risk ratios are the same for all watersheds as in Alternative 2. Effects are considered to be identical to that alternative.

Landslides: Risk ratios are the same for all watersheds as in Alternative 2. Effects are considered to be identical to that alternative.

ERA: All watersheds show an increase in risk ratio under this alternative, although all remain below 1.0. Changes in risk ratios are similar to Alternative 2, although effects are reduced in Long John and Beaver-Grouse. Effects are considered to be generally the same as under Alternative 2.

5th Field Watersheds

Risk ratios for the Beaver Creek 5th field watershed are identical to those for Alternative 2.

Wildfire Effects

In the event of a wildfire, Alternative 5 will reduce burn severities from the current condition. The effects will be similar to those described under Alternative 2. Please refer to Table 3-25.

Effects on Aquatic Habitat

Alternative 5 will slightly increase the risk of sediment entering the stream from ground-disturbing activities. Road decommissioning activities will increase risk of sediment introduction to streams somewhat in the short term, but that risk is reduced in the long term. Risk is also reduced from improved maintenance in the short and long term. The risks of cumulative effects from catastrophic wildfire are similar to those from the No Action Alternative.

Temperature: This alternative does not affect stream temperature since no vegetation will be removed from the Riparian Reserves.

There is no commercial thinning within the first site potential tree height (170') of Riparian Reserves adjacent to flowing or standing water. Canopy shade will not be affected by removal of trees <9" DBH and piling of material as part of fuels reduction. Hazard trees may be felled along roads in Riparian Reserves but will not affect stream temperature because removing few, scattered hazard trees will not affect canopy shade. Commercial thinning in the outer 170'–340' of Riparian Reserves will not affect canopy shade since trees located outside the first site potential tree height do not contribute to steam shade.

Embeddedness: The effects are considered to be similar to those under Alternative 2.

Peak Flow: The effects are similar to Alternative 2 with a slightly reduced risk of peak flows and related channel effects in Long John Creek and Grouse Creek.

Effect on Water Quality for Other Beneficial Uses

Effects are the same as for Alternative 2; please see discussion on p. 3-149. All beneficial uses will be maintained in the long term. This alternative is consistent with Basin Plan direction, and State and Federal water quality laws.

Consistency with Aquatic Conservation Strategy

Effects are the same as for Alternative 2; please see discussion on p. 3-149.

Areas with Watershed Concerns

Effects are the same as for Alternative 2; please see discussion on p. 3-150.

Preferred Alternative: Cumulative Effects

CWE Model Outputs

7th Field Watersheds

Table 3-28 displays the change in risk ratio in each 7th field watershed for each component of the Cumulative Watershed Effects model for the Preferred Alternative compared to Alternative 1.

Table 3-28 Change in Risk Ratios by Watershed and Model Indicator for the Preferred Alternative

Model	Change/ Risk Ratio	Deer-Beaver	Upper Cow	Long John	Beaver-Grouse	Headwaters Cottonwood
USLE	Change	+0.09	0	+0.10	+0.09	+0.01
	Risk Ratio	1.02	0.66	0.98	1.03	0.42
GEO	Change	+0.02	0	-0.05	-0.02	0
	Risk Ratio	0.89	0.49	1.37	1.45	0.86
ERA	Change	+0.17	+0.02	+0.38	+0.26	+0.06
	Risk Ratio	0.86	0.33	0.76	0.79	0.32

Surface Erosion: Risk ratios increase slightly in Deer-Beaver, Long John and Beaver-Grouse. Effects are considered to be generally the same as under Alternative 2.

Landslides: Risk ratios vary only slightly from all watersheds as calculated for Alternative 2. Effects are considered to be the same as for Alternative 2.

ERA: All watersheds show an increase in risk ratio under the Preferred Alternative, although all remain below 1.0. Changes in risk ratios are similar to Alternative 2, although effects are reduced in Long John, Upper Cow and Headwaters Cottonwood. Effects are considered to be generally the same as under Alternative 2.

5th Field Watersheds

Risk ratios for the Beaver Creek 5th field watershed are identical to those for Alternative 2.

Wildfire Effects

In the event of a wildfire, the Preferred Alternative will reduce burn severities from the current condition. The effects will be similar to those described under Alternative 2.

Effects on Aquatic Habitat

The Preferred Alternative will slightly increase the risk of sediment entering the stream from ground-disturbing activities. Road decommissioning activities will increase risk of sediment introduction to streams somewhat in the short term, but that risk is reduced in the long term. Risk is also reduced from improved maintenance in the short and long term. The risks of cumulative effects from catastrophic wildfire are similar to those from the No Action Alternative.

Temperature: This alternative does not affect stream temperature since no vegetation will be removed from the Riparian Reserves.

There is no commercial thinning within the first site potential tree height (170') of Riparian Reserves adjacent to flowing or standing water. Canopy shade will not be affected by removal of trees <9" DBH and piling of material as part of fuels reduction. Hazard trees may be felled along roads in Riparian Reserves but will not affect stream temperature because removing few, scattered hazard trees will not affect canopy shade. Commercial thinning in the outer 170'–340' of Riparian Reserves will not affect canopy shade since trees located outside the first site potential tree height do not contribute to steam shade.

Embeddedness: The effects are considered to be similar to those under Alternative 2.

Peak Flow: The effects are similar to Alternative 2 with a slightly reduced risk of peak flows and related channel effects in Long John Creek and Upper Cow Creek.

Effect on Water Quality for Other Beneficial Uses

Effects are the same as for Alternative 2; please see discussion on p. 3-149. All beneficial uses will be maintained in the long term. This alternative is consistent with Basin Plan direction, and State and Federal water quality laws.

Consistency with Aquatic Conservation Strategy

Effects are the same as for Alternative 2; please see discussion on p. 3-149.

Areas with Watershed Concerns

Effects are the same as for Alternative 2; please see discussion on p. 3-150.

Conclusions

The No Action Alternative will have no direct effects on watershed and stream conditions. The road density will remain unchanged. Indirect effects may occur as the risk of large-scale, high severity wildfire increases over time. A fire under severe conditions will result in 60%–100% canopy loss. Intense soil heating would negatively affect soil porosity. Canopy loss and reduced soil porosity will increase erosion and runoff rates, with a resultant rise in sedimentation and an increase in risk of higher peak flows.

The increased erosion following high severity wildfire could change the current occasional brief periods of sedimentation and turbidity to prolonged chronic periods, which would increase

embeddedness. This in turn would reduce the quality of spawning habitat, and adversely affect the quality of juvenile rearing habitat and adult holding habitat.

For the action alternatives, pumping of water at drafting sites will cause short-term impacts to fish habitat. Short-term disturbance will result from roadwork, landing construction, and conventional yarding. Alternative 2 will result in a greater amount of disturbance due to more acres of ground-based skidding. Effects to channel condition, water quality, and fish habitat are expected to be minimal due to use of site-specific project design standards and the existence of large, functioning Riparian Reserves. Sediment generated as a result of the action will not be measurable with any action alternative.

Long-term impacts would be primarily associated with risk of large-scale high severity wildfire. Canopy reduction and reduced soil infiltration can increase erosion and runoff rates with a resultant rise in sedimentation. Alternatives 2, 4, 5, and the Preferred Alternative treat both activity and natural fuels, measurably reducing potential fire risk and fire severity from that expected under the No Action Alternative. The Preferred Alternative with an addition of 1,297 acres of underburning will have the most benefit from a fuels reduction standpoint.

Although current disturbance levels are high, the channels appear to be generally stable and resilient. Cumulative effects from the four action alternatives are similar. In each case, risks of changes in erosion and peak flow increase for all affected watersheds over the current situation; however, all but four indicators remain below 1.0. The two indicators that exceed 1.0 are USLE values for Beaver-Grouse and Deer-Beaver and GEO values for Long John and Beaver-Grouse. The USLE values are 0.01 and 0.03 above the 1.0 threshold value for Deer-Beaver and Beaver-Grouse, respectively. Deer-Beaver and Beaver-Grouse watersheds have an elevated risk for cumulative effects. Effects are negligible for the other three watersheds. The GEO values, while over the 1.0 threshold, improve under every action alternative. The risk for increasing cumulative effects with any action alternative is very low to low.

Any action alternative will result in long-term benefits to aquatic habitat, because the risk of post-fire delivery of sediment to streams is reduced at the site and watershed scales. Any action alternative will protect riparian and aquatic habitat from future wildfire effects, while maintaining the overall functioning of aquatic habitat. Fish and their habitat will not be adversely affected in the short or long term.

Beneficial uses will not be affected due to project design features, functioning Riparian Reserves and the distance downstream from the Project Area. Basin Plan objectives will be met by the action alternatives.

3.5 Soils

3.5.1 Analysis Methods

One significant issue identified for this project relates to soils. Temporary road construction may result in long-term impacts to soil health, such as soil displacement, soil erosion, mass wasting, reduced slope stability, compaction, and loss of productivity. The key indicator used to analyze this issue is the acres of reduced soil productivity.

3.5.1.1 Modeling Changes in Soil Productivity

Forest Service Handbook 2509.18-91-1 and 1995 Region 5 Supplement FSH 2509.18-95-1 collectively established Soil Quality Analysis Standards which were adopted in the LRMP. The Soil Quality Analysis Standards provides threshold values that indicate when changes in soil properties and soil conditions would result in impairment of soil productivity. The threshold values are not mandatory standards, but are intended to be used as guidance in developing projects and assessing impacts. For soil productivity, the Soil Quality Analysis Standards set a threshold of 15% reduction of soil productivity, analyzed on a treatment unit basis. This is interpreted to mean that long-term soil productivity loss will not exceed standards and will not result in a statistically significant reduction in biomass produced on more than 15% of the acres within a treatment unit.

The proposed activities will affect soil productivity primarily through construction and use of temporary roads and landings, and use of mechanical skidding equipment. Constructed roads on slopes can affect productivity through removal of soil and nutrients. Repeated travel by heavy equipment results in compaction that affects vegetation establishment, growth, and survival. Compaction and soil displacement are used to estimate impacts to soil productivity. Only soil compaction considered to be detrimental to soil productivity is included in the analysis; areas that show slight increases in compaction are not considered. Compaction is considered detrimental when it exceeds threshold bulk density values measured at 4”–8” soil depth. Currently compacted sites include old temporary roads, landings or skid trails where bulk density has not yet recovered. Soil displacement is considered detrimental to soil productivity when an activity removes more than 15% of the organic matter in the upper 12” of soil over an area larger than 1 square meter. This type of disturbance is found on constructed roads and landings where cuts were made into the slope and topsoil was completely removed. These types of impacts are considered to be long-term (100+ years) in nature. Roads that are part of the Forest Transportation System are not included in these calculations because they are not managed for vegetation.

The Soil Quality Analysis Standards recommends calculating cumulative effects on a treatment unit basis. Current soil productivity conditions for each unit were calculated using unit specific data from the Project Area to estimate the number of acres with some level of soil compaction or displacement from past management activities. The calculated figure was added to the estimated amount of disturbance arising from the proposed management activities, and then divided by the total unit acres. The result, expressed as a percentage for each unit, was compared to the Soil Quality Analysis Standards threshold of 15%. The unit either meets or exceeds the threshold.

The unit analysis approach described above may underestimate actual impacts to productivity because it does not include acres in landings or temporary roads that are outside unit boundaries. Therefore, a value was calculated for the entire project that included all present and proposed disturbed acres, divided by the total number of acres within units, landings, and temporary roads. The resulting figure was compared to the Soil Quality Analysis Standards threshold.

Assumptions, considerations, and limitations of the analysis process:

1. A soil scientist visited most units, especially those where ground-based logging would occur, and secured plot data on current levels of disturbance.

2. A geologist visited most of the temporary road alignments in the field to assure that they did not cross unstable land.

3. The potential adverse cumulative effects of proposed temporary roads as related to landslides was evaluated by means of the GEO model which assess landslide potential on a watershed scale. This was done through a GIS exercise by overlaying all temporary roads with the KNF geomorphic map, and evaluating possible sediment production from these roads.

4. Application of geologic resource production measures listed in the Geologic Specialist Report (de la Fuente 2007) will greatly reduce the potential for any landsliding from temporary roads.

5. Unit selection was based on soil sensitivity and type of management activities planned. Units that had the potential to be logged with ground-based mechanical systems were a priority for field review.

6. Units that were not visited were assigned an average level of disturbance based on the field data gathered for other units.

7. Calculations for acres disturbed by temporary roads and landings were based on the following assumptions:
    - Landing = 0.5 acre
    - 1 mile of temporary road = 2 acres

3.5.2 Affected Environment

Soils in the Project Area have developed from primarily granitic rock with lesser amounts from metasediments and serpentinized peridotite. The major soils formed from granitic rocks are Goodwin and Rogue Series at the higher elevations and Siskiyou, Dome, and Holland Series at the lower elevations. These coarse-textured soils are sensitive to disturbance due to low cohesion, a weak buffering capacity and lower resiliency. These soils are predominately deep to very deep (40–60+ inches) gravelly sandy loams. Soils formed from metasedimentary rocks are Smokey and Althouse Series at the higher elevations and Neuns, Kindig, and Fong Series at the lower elevations. These medium textured soils are moderately sensitive to disturbance due to moderate cohesion, a strong buffering capacity and moderate resiliency. These soils are predominately moderately deep to very deep (20–60+ inches) gravelly loams to very gravelly loams. Soils formed from serpentinized peridotite are predominately Dubakella Series. This medium to fine textured soil is moderately sensitive to disturbance due to moderate to strong cohesion, a strong buffering capacity and moderate resiliency. This soil is predominately moderately to deep (20–60+ inches) very gravelly loam over very gravelly clay loam. Soils in the Project Area are moderately to highly productive; natural conifer regeneration is good. Existing erosion hazard ratings are low due to high levels of existing soil cover (79%–99% with an average of 94% throughout the Project Area).

The Project Area currently meets the LRMP standards for:

- Soil cover (70%–80% cover)
- Porosity (retains >90% existing soil porosity)
- Soil organic matter content (retains >85% of organic matter in upper 12” of soil)
- Surface organic matter levels (retains >50% fine surface organic matter)
- Soil moisture regime (internal soil drainage properties remain unchanged)
- Soil hydrologic function (soil permeability remains moderate to rapid
- Buffering capacity (soil pH and buffering and exchange capacities remain unchanged).

Excluding roads, 95% of the soils in the Project Area have well-functioning soil physical and biological systems. A complete soils analysis is included in the Soil Report (Laurent 2007a) and Addendum to the Soil Report (Laurent 2008), which is part of the project file.

Compaction and soil displacement are caused primarily by use of heavy equipment, skidding of logs, and construction of roads and landings. Soils within the treatment units have been affected by soil compaction and displacement from past timber harvest activities. Seventy-fire percent of the disturbance is existing skid trails, 15% is full bench skid trails, 5% is existing temporary roads, 1.5% is old rail road logging troughs (from skidding logs), 1.5% is tractor scalped areas, 1.5% is terraces, 0.25% is old tractor piles and 0.25% is old water ditches. In proposed ground-based yarding units, these effects range from 0 to 21% of the unit acres, averaging 4.7%. In skyline units, the range is 0%–12%, averaging 3%. In helicopter units, the range is 0%–19%, averaging 5%.

Units 332 and 343 currently exceed the Soil Quality Analysis Standards detrimental disturbance threshold of 15%.

3.5.3 Environmental Consequences

3.5.3.1 Alternative 1

There will be no direct effects on soils under Alternative 1.

Soil productivity will be maintained at current levels in all units. Over time (23–50 years) subsurface soil compaction will decline as compacted areas slowly recover and porosity increases due to biological activities (Andrus and Froehlich 1983). Sites with soil displacement will recover much slower (40–100+ years, depending on the level of displacement).

3.5.3.2 Alternatives 2, 4, 5, and the Preferred Alternative

Impacts to soils are similar under all four action alternatives, so they are discussed together.

Direct and Indirect Effects

Use of heavy equipment on existing roads and landings will not result in additional compaction since it is assumed that existing compaction is at maximum levels. Compaction will occur on existing and new skid trails within units, new landings, and new temporary roads. Soil displacement will occur on temporary roads, landings and to a lesser extent on skid trails. Small increases in compaction may occur in other areas where equipment makes one or two passes, but these increases are not expected to be detrimental to soil productivity. Effects associated with each type of management activity are detailed below.

The primary indirect effects on soil from compaction and soil displacement are the loss of productivity over time, and erosion of soil from the impacted sites. Erosion impacts are considered in the watershed cumulative effects modeling which is discussed in the Section 3.4.

Ground-based Mechanical Yarding

Ground-based mechanical yarding will result in compaction from repeated passes of track or rubber-tired skidders on existing and new skid trails and temporary roads. Design features call for reuse of existing skid trails and a skid trail design pattern that minimizes the number of skid trails. Compacted sites in units that are currently above the 15% Soil Quality Analysis Standards threshold,

or that are approaching that level, will be treated by subsoiling. Subsoiling uses winged rippers pulled behind a caterpillar tractor to till the soil to a depth of 18" to break up compacted soil. This has been shown to be an effective method of reducing compaction and restoring porosity to the soil when the soil is dry over the entire subsoiling depth (Andrus and Froehlich 1983; Atzet et al. 1989). Units 220, 234, 342, 343, 368, 709, and 756 will be treated by subsoiling.

There are 1,202 acres of ground-based yarding proposed in Alternative 2, 965 acres in Alternative 4, 1,065 acres in Alternative 5, and 1,056 acres in the Preferred Alternative.

Skyline Yarding

This yarding method displaces soil in the yarding corridors due to one end of the logs dragging along the ground. The skyline corridor can vary from 6'–8' wide and will have an area in the center of the corridor that may be downcut up to 9"–12" deep, depending on the size and number of trees yarded in each corridor (Laurent pers. comm.). Small diameter (10"–12") logs create less disturbance and downcutting than larger logs. Most soil disturbance occurs in the center of the corridor, within the upper two-thirds of the corridor's length. The area of displaced soil is measurable, but is not significant in relation to the size of the unit.

There are 1,602 acres of skyline yarding proposed in Alternative 2, 1,528 acres in Alternative 4, 1,471 acres in Alternative 5 and 1,610 acres in the Preferred Alternative.

Helicopter Yarding

A small amount of soil compaction and displacement occurs during helicopter yarding. Compaction occurs when felled trees hit the soil surface. Displacement can occur if the tail-end of the logs drag along the soil surface during yarding operations. Changes in compaction are captured through a slight inflation in the estimates of existing compaction in helicopter treatment units. The amount of soil displaced is not measurable.

Landings

Landings, which are needed for logging operations, are drastically disturbed sites with high levels of compaction and soil displacement. The size of individual landings is guided by safety requirements. Generally, landings are kept to the smallest size practical, approximately 0.25–1 acre each. Helicopter landings are generally larger. Existing landings will be reused where possible. Loss of productivity due to soil displacement is generally considered to be a long-term impact.

Alternative 2 proposes approximately 40 new landings (roughly 25 acres), Alternative 4 proposes approximately 34 new landings (approximately 22.5 acres), Alternative 5 proposes approximately 31

new landings (approximately 21 acres) and the Preferred Alternative proposes 43 new landings (approximately 22 acres).

Temporary Road Construction

Temporary road construction and use can affect soil productivity. Soil displacement occurs during construction activities such as road bed construction, installation of rolling dips, outsloping the road bed, and culvert installation. It also occurs if a bench cut is required. Soil may be displaced during rehabilitation of these roads as well. Compaction occurs through repeated use. Compaction can be mitigated through subsoiling; however, loss of productivity through soil displacement is generally considered to be a long-term impact. Soil displacement will result from construction of 6.86 miles (about 14 acres) of temporary roads in Alternative 2, 4.96 miles (about 10 acres) of temporary roads in Alternative 4, 2.27 miles (about 4.5 acres) of temporary roads in Alternative 5 and 1.7 miles (about 3.4 acres) of temporary roads in the Preferred Alternative.

Machine Mastication

Track-mounted masticators are used on slopes up to 35% to shred surface organic material. The masticator head is mounted on a boom that swings from side to side, reaching out beyond the tracked vehicle. This articulation reduces the number of cutting passes the equipment makes through a unit. The machine generally travels on top of the treated material, and is used during dry soil conditions. Masticators are lighter in weight and have lower ground pressure than other types of heavy equipment. They typically travel over the same route only once, so increases in compaction under dry soil conditions are minimal and do not impact soil productivity.

Soil displacement from mastication is limited to sites where the machine turns. Impacts to soil productivity are considered to be minimal (Laurent 2007b).

Other Activities

Underburning, precommercial thinning, hand piling/pile burning, and road maintenance are not considered to affect soil productivity through compaction, soil displacement, or nutrient loss. This is due either to the fact that their impacts are not large enough to be measurable, or they are sites (such as roads) where maintaining soil productivity is not a goal.

Cumulative Effects

Cumulative effects for soil productivity include impacts from past and proposed activities including: ground-based, skyline and helicopter yarding; temporary road construction and use; and landing construction and use. There are no foreseeable future activities within the Project Area.

All units, with the exception of two, meet the Soil Quality Analysis Standards detrimental disturbance standard of 15% both before and after the project. Units 332 and 343 currently exceed the Soil Quality Analysis Standards standard of 15% due to past disturbance. Unit 343 will be subsoiled to bring it within the 15% standard. Unit 332, which will be helicopter yarded, will not be subsoiled in order to prevent excessive disturbance since 58% of the slopes in this unit exceed 35%. Helicopter yarding will not increase the level of detrimental disturbance in unit 332.

The results of the cumulative effects analysis that included all disturbances, including temporary roads and landings, are displayed in Table 3-29. All alternatives will affect soil compaction, and result in some loss of soil productivity due to soil displacement, primarily from temporary roads and landings.

Table 3-29 Cumulative Effects On Soil Productivity From Action Alternatives

Type of Disturbance	Alternative 2 Acres*	Alternative 4 Acres*	Alternative 5 Acres*	Preferred Alternative Acres
Ground-based (tractor and mechanical harvester)	110	96	110	97
Skyline	102	104	101	106
Helicopter	61	42	65	55
Temporary roads (new and existing)	59	55	50	48
Landings (new and existing)	43	41	39	40
Mastication unit (existing+new)	3	3	3	3
Total	378	341	368	349
Acres disturbed/total acres within harvest units, temporary roads and landings**	9.7%	10.1%	9.7%	9.6%

*Acre values for each alternative include both existing and proposed disturbance

**Riparian Reserve treatments and underburning are not shown because their effects on soil productivity are minimal to none.

Soil productivity will be affected on approximately 10.1% or less of the acres treated or affected by the project. Alternative 2 has the highest potential to impact soil productivity. Soil productivity in some units will improve over current conditions where subsoiling is utilized, however subsoiling will not be used on landings.

Summary of Effects on Soil Productivity

Compaction: Alternative 2 proposes the most ground-based yarding, road construction, and landing construction of the four action alternatives, and thus will result in the highest amount of soil compaction. Implementation of project design standards, such as reusing existing skid trails and

subsoiling of some skid trails, will mitigate some impacts. Unit 343, which is currently above the Soil Quality Analysis Standard threshold of 15%, will be treated to reduce compaction. Upon completion of the project, all units except helicopter unit 332 will meet the Soil Quality Analysis Standard detrimental disturbance threshold of 15%.

Soil Displacement: Soil displacement will occur through construction of temporary roads, landings and to a lesser degree in skid trails. Soil displacement is highest in Alternative 2, which proposes the most miles of roads and the highest number of new landings. This is considered to be a long-term effect and has been considered in the cumulative effects analysis. Full recovery of landings will take a long time (100+ years) due to soil displacement and compaction. Erosion of soil that might affect aquatic resources has been considered in the cumulative watershed analysis.

3.6 Special Status Plant Species

3.6.1 Analysis Methods

The Project Area contains several populations of special status species. Five USFS Sensitive species, two of which are also Survey and Manage species, are known in the Project Area. No Federally listed Threatened, Endangered, or Proposed species are known to occur in the area. Additionally, there are five fungi and one bryophyte species listed as Sensitive which have potential to occur in the Project Area but are unlikely to occur in areas of ground-disturbing activities. No noxious weeds are known to occur within the Project Area boundary. The Mt. Ashland-Siskiyou Peak Botanical Special Interest Area (BSIA) is located within the Project Area boundary at the highest elevations and outside of project activity areas. This section discusses the pre-field review and field survey methods and contains information on individual species with potential to occur in the Project Area.

An office prefield review and a preliminary field review were conducted to determine if this project is within the range of any KNF listed Threatened, Endangered, Proposed, Sensitive, or Survey and Manage species, and if suitable habitat is present within the proposed Project Area (USDA Forest Service 2006d). The preliminary field review was intuitive controlled, searching for habitats that support these species. The objective of this review was to determine if suitable habitats were present, and thus if further surveys would be required. All Sensitive, Threatened, Endangered, Proposed, and Survey and Manage species listed for the KNF were considered during this review (USDA Forest Service 2003a, 2006e). Surveys are not required for species for which suitable habitat is not present, and for which the Project Area is outside of the currently known range of the species.

Table 3-30 Sensitive Plant Species with Habitat Occurring in the Project Area

Species	Code	Status-Plant Type	Field Survey Recommended
Cypripedium fasciculatum	CYFA	Sensitive-vascular	Yes
Cypripedium montanum	CYMO2	Sensitive-vascular	Yes
Horkelia hendersonii	HOHE2	Sensitive-vascular	Yes
Lupinus lepidus ssp. ashlandensis	LULEA	Sensitive-vascular	Yes
Tauschia howellii	TAHO2	Sensitive-vascular	Yes
Ptilidium californicum	PTCA5	Sensitive-bryophyte	Yes
Boletus pulcherrimus	BOPU4	Sensitive-fungi	Habitat evaluation only, no surveys required
Cudonia monticola	CUMO2	Sensitive-fungi	
Dendrocollybia racemosa	DERA5	Sensitive-fungi	
Phaeocollybia olivacea	PHOL	Sensitive-fungi	
Sowerbyella rhenana	SORH	Sensitive-fungi	
Buxbaumia viridis	BUVI2	Sensitive-bryophyte	Habitat evaluation only, no surveys required

Table 3-31 ESA Protected Species

Scientific Name	Common Name	Status
Arabis macdonaldiana	McDonald's rock-cress	Federal Endangered
Astragalus applegatei	Applegate's milk-vetch	Federal Endangered
Fritillaria gentneri	Gentner mission-bells	Federal Endangered (Field survey recommended)
Phlox hirsuta	Yreka phlox	Federal Endangered

Project-specific surveys were conducted in October 2003, July, August and September 2004, May, June, July, and August 2005, and October, November and December 2006. All areas within the Project Area boundary which were proposed for ground disturbing activities in the DEIS (USDA Forest Service 2007f) have been surveyed for the seven target species for which surveys were recommended (Cypripedium fasciculatum (CYFA), Cypripedium montanum (CYMO2), Fritillaria gentneri (FRGE), Horkelia hendersonii (HOHE2), Lupinus lepidus var. ashlandensis (LULEA), Tauschia howellii (TAHO2), and Ptilidium californicum (PTCA5)) (USDA Forest Service 2006d). All areas of proposed ground disturbance within the Preferred Alternative have been surveyed for these species with the exception of the 1297 acres of additional unberburning outside of treatment stands. These areas have been partially surveyed.

All areas within the Project Area boundary which are proposed for ground disturbing activities have been surveyed for the seven target species (CYFA, CYMO2, FRGE, HOHE2, LULEA, TAHO2, and PTCA5). Field surveys were timed to correspond with the time period that each species could be most readily identified. Surveys were conducted by botanists or by wildlife biologists and biological technicians trained in the identification of the target species.

Of the seven target species, habitat is present only for CYFA, CYMO2, and PTCA5 within the 1297 acres proposed for underburning outside of treatment stands. Surveys for PTCA5 were conducted within all suitable habitat within the Project Area boundary, including the proposed underburning

acres, in October, November, and December of 2006. Surveys for CYFA, and CYMO2 were conducted from 2003 to 2005 within approximately 600 acres of the 1297 proposed underburning acres. Of the approximately 700 remaining unsurveyed acres, there are approximately 100 acres of suitable habitat for CYFA and CYMO2. The potential for finding new populations within these areas is low. There is no habitat present for the remaining target species (FRGE, HOHE2, LULEA, and TAHO2) within the areas proposed for underburning.

The Forest Noxious Weed Database was used for information on noxious weed sites that are currently mapped within or adjacent to the Project Area. Inventory in the Project Area was conducted in 2002 by the Forest Noxious Weed program (USDA Forest Service 2002b), and in 2005 during TES plant surveys (USDA Forest Service 2006e).

The significance of management activities upon plant species viability depends upon many factors, including the size of known populations, the wider geographic range of known plant populations outside of the Project Area, and the degree of species sensitivity to short-term and long-term habitat modification. The alternatives are evaluated in terms of how they would affect plant species viability in the context of the above factors.

3.6.2 Affected Environment

Two populations of Henderson's horkelia *(Horkelia hendersonii)*, one population of Mt. Ashland lupine *(Lupinus lepidus* var. *ashlandensis*), four populations of Howell's tauschia *(Tauschia howellii),* and one population of *Ptilidium californicum* were previously recorded within the Project Area. One new population of mountain lady-slipper orchid *(Cypripedium montanum)* and one new population of *Ptilidium californicum* were located within the Project Area during recent surveys. No populations of *Cypripedium fasciculatum* or *Fritillaria gentneri* were located during project surveys.

3.6.2.1 Threatened and Endangered Plants

The project is not within the range or habitat of *Arabis macdonaldiana*, *Astragalus applegatei*, or *Phlox hirsuta.* Surveys were negative for *Fritillaria gentneri*. No Federally listed Threatened, Endangered, or Proposed plant species would be affected by this project. Thus, these species are not further discussed in this FEIS.

3.6.2.2 Sensitive Plants

The Region 5 Regional Forester lists plants as Sensitive based on concerns for species viability. Sensitive plants may occur in few to large numbers in a small, localized area, or in specialized

habitats within a wide geographical area. Of the 51 sensitive plant species likely to occur on the Forest, the Project Area contains known populations for four vascular and one bryophyte species:

- *Cypripedium montanum* (mountain lady's slipper): One population of this species was discovered within the lower Grouse Creek drainage. This population is not within or adjacent to any area proposed for ground-disturbing activities. It is approximately 0.25 miles from the closest project activity area
- *Horkelia hendersonii* (Mt. Ashland horkelia), *Lupinus lepidus ssp. ashlandensis* (Mt. Ashland lupine), and *Tauschia howellii* (Howell's tauschia): Several populations of these species were previously known within the Project Area. These populations are found at the highest elevations of the Project Area along the Siskiyou Crest. The plants are found within open dry meadows along ridge tops. These populations are within the Project Area boundary, but well outside any area that will be impacted by project related activities. The closest population is more than 0.25 miles from the closest project activity area.
- *Ptilidium californicum* (Pacific fuzzwort): Two populations of this species are known within proposed project activity areas. The boundaries of these populations are mapped. As part of the project design features, protection buffers of one site tree height will be applied around the two *Ptilidium californicum* populations found within units. These protections have been determined to be adequate to protect the plants and habitat elements upon which they depend (USDA Forest Service 2007g).

The Project Area contains potentially suitable habitat for five sensitive fungi and one sensitive bryophyte species. The fungi are *Boletus pulcherrimus, Cudonia monticola, Dendrocollybia racemosa, Phaeocollybia olivacea, and Sowerbyella rhenana.* The bryophyte is *Buxbaumia viridis.* Due to the rarity of these species and the small amount of potentially suitable habitat within the Project Area, there is a low probability that these species may occur within the Project Area. The majority of the fungi habitat and the entire bryophyte habitat occurs within the wetter environments of riparian areas and within 50' of these areas. The potentially suitable habitat for these species will be protected from timber harvest activities because no vegetative removal is proposed within 170 feet of streams in Riparian Reserves, and all necessary habitat elements for these species will be maintained (USDA Forest Service 2007g).

The Project Area contains potentially suitable habitat for two vascular plant species, *Cypripedium fasciculatum* and *Cypripedium montanum*. Suitable habitat is found within approximately 100 acres of the area proposed for underburning outside of treatment units. Based on the number of acres that have been surveyed and the number of known population sites the potential for undiscovered populations to occur is low. If present, the species would most likely occur on north facing shady slopes, near the toe of the slope, and near creeks (USDA Forest Service 2007h).

No suitable habitat for the remaining 39 sensitive plant species lies within the Project Area.

3.6.3 Environmental Consequences

Sensitive Plants and Survey and Manage Species are each discussed in the following sections.

3.6.3.1 Sensitive Plants

Effects of the No Action Alternative

In this alternative, there is an increased risk of wildfire within the Project Area, which may have effects upon the species of concern (USDA Forest Service 2007g).

- *Cypripedium montanum, Horkelia hendersonii, Lupinus lepidus ssp. ashlandensis,* and *Tauschia howellii:* These known sites are located in areas which would not be affected by a wildfire due to the open nature of the habitat, or the lack of excessive fuels buildup. There would be no direct, indirect, or cumulative effects to these species.

Cypripedium fasciculatum and Cypripedium montanum: There is potential that an undiscovered population could be affected if a portion is burned in a wildfire. This would be a direct effect to individuals. A low-intensity wildfire would retain adequate mature live overstory and understory trees, adequate substrate recruitment trees, and coarse and fine woody debris. The retention of these habitat elements would ensure that potential populations of these species would be maintained. There is a moderate risk that these areas would be impacted by a high intensity stand replacing wildfire. There may be an indirect effect to these species from the elimination of suitable habitat. There is not likely to be a cumulative effect, and no change to the species' viability within the Project Area because all known populations have been protected.

- *Boletus pulcherrimus, Phaeocollybia olivacea, Dendrocollybia racemosa, Cudonia monticola,* and *Sowerbyella rhenana*: There is potential that a population could be affected if a portion is burned in a wildfire, but it is unlikely that a wildfire would burn at high intensity throughout the entire population's habitat, which occurs in wetter areas. This would be a direct effect to individuals. There is a low risk that these moist areas would be impacted by a high-intensity stand-replacing wildfire. There would be no indirect effects to these species from the elimination of suitable habitat. There is not likely to be a cumulative effect because the majority of suitable habitat would be maintained along riparian areas.

- *Buxbaumia viridis:* In this alternative, there is likely to be no effect to this species from an increased risk of wildfires. The habitat occurs within the Riparian Reserves, and on large diameter rotten logs that are directly inserted within the perennial creeks. This substrate is not likely to burn in a wildfire and the adjacent stand would not burn at a high intensity due to the high moisture conditions in riparian areas. There would be no direct, indirect, or cumulative effects to this species.

- *Ptilidium californicum*: There is potential for effects to the populations from a wildfire which could scorch the base of the trees on which the PTCA5 occurs, killing the plants. This would be a direct effect to the populations. There may be an indirect effect to the populations if there is a crown fire that kills

overstory trees that provide the existing shade. There is not likely to be a cumulative effect to the species from this and other projects because only two populations are known within the Project Area boundary. An adverse effect to these populations from an increased risk of wildfire may affect the species presence within the Project Area boundary, but is not likely to affect viability on the KNF or within the species range. The species has a wide distribution on the KNF and is common in Oregon and Washington.

Effects of Alternative 2

In this alternative, potential effects to species of concern have been reduced through the use of Riparian Reserve buffers and Project Design Standards which protect the species from the effects of project activities. There may be an effect to some species from fuel reduction activities within species' habitat or adjacent to known populations (USDA Forest Service 2007g).

- *Cypripedium montanum, Horkelia hendersonii*, *Lupinus lepidus* var. *ashlandensis* and *Tauschia howellii*: In this alternative, all four species are located more than 0.25 miles from the closest proposed project activity area. There will be no direct effect to individuals or populations and existing habitat conditions would be maintained at each population site. The distance from the closest activity area is great enough that there would be no indirect effects from any of the project activities. There will be no direct, indirect, or cumulative effects to these species.

- *Boletus pulcherrimus, Phaeocollybia olivacea, Dendrocollybia racemosa, Cudonia monticola,* and *Sowerbyella rhenana*: In this alternative, there will be no timber harvest effects within the riparian buffers in which the species may potentially occur. There may be direct effects to individuals from the low intensity underburns, but these are not expected to affect populations in their entirety (USDA Forest Service 2007g). There will not be indirect or cumulative effects to populations or their habitat because the habitat elements upon which the species depend will be maintained within the Project Area.

- *Buxbaumia viridis:* In this alternative, there will be no effects to the species from timber harvest due to the location of the habitat, which is outside of the timber harvest units and within the Riparian Reserves. The species' habitat occurs within the wettest portions of the riparian areas, and underburns would not affect these areas. There will be no direct, indirect or cumulative effects to populations or their habitat.

- *Ptilidium californicum*: In this alternative, the two known sites have been buffered one site tree distance (150') from timber harvest activities, and 25' from handpile and burn activities. These buffers have been shown to adequately protect the habitat elements upon which the species depends (USDA Forest Service 2007g). Because these populations will be protected, there will be no direct, indirect, or cumulative effects to the species.

Effects of Alternatives 4 and 5

In these alternatives, effects to all species of concern will be the same as the effects in Alternative 2.

Effects of the Preferred Alternative

In this alternative, potential effects to species of concern have been reduced through the use of Riparian Reserve buffers and Project Design Standards which protect the species from the effects of

project activities. There may be an effect to some species from fuel reduction activities within species' habitat or adjacent to known populations (USDA Forest Service 2007h).

Cypripedium fasciculatum and Cypripedium montanum: In this alternative, there will be no timber harvest effects within the approximately 100 acres of habitat in which the species may potentially occur. There are no timber harvest activities proposed for these areas. There may be direct effects to individuals from the low intensity underburns, but these are not expected to affect populations in their entirety (USDA Forest Service 2007h). There will not be indirect or cumulative effects to potential populations or their habitat because the habitat elements upon which the species depend will be maintained within the Project Area. There will be no effect to the one known population of Cypripedium montanum. This site is located more than ¼ mile from the closest proposed project activity area.

Horkelia hendersonii, Lupinus lepidus var. ashlandensis and Tauschia howellii: In this alternative, all three species are located more than ¼ mile from the closest proposed project activity area. There will be no direct effect to individuals or populations and existing habitat conditions would be maintained at each population site. The distance from the closest activity area is great enough that there would be no indirect effects from any of the project activities. There will be no direct, indirect, or cumulative effects to these species.

Boletus pulcherrimus, Phaeocollybia olivacea, Dendrocollybia racemosa, Cudonia monticola, and Sowerbyella rhenana: In this alternative, there will be no timber harvest effects within the riparian buffers in which the species may potentially occur. There may be direct effects to individuals from the low intensity underburns, but these are not expected to affect populations in their entirety (USDA Forest Service 2007g). There will not be indirect or cumulative effects to populations or their habitat because the habitat elements upon which the species depend will be maintained within the Project Area.

Buxbaumia viridis: In this alternative, there will be no effects to the species from timber harvest due to the location of the habitat, which is outside of the timber harvest units and within the Riparian Reserves. The species' habitat occurs within the wettest portions of the riparian areas, and underburns would not affect these areas. There will be no direct, indirect or cumulative effects to populations or their habitat.

Ptilidium californicum: In this alternative, the two known sites have been buffered one site tree distance (150 ft.) from timber harvest activities, and 25 ft. from handpile and burn activities. These buffers have been shown to adequately protect the habitat elements upon which the species depends (USDA Forest Service 2007g). Because these populations will be protected, there will be no direct, indirect, or cumulative effects to the species.

3.6.3.2 Survey and Manage Species

All survey and manage species requiring pre-disturbance surveys have been evaluated, and field surveys were conducted for species with potentially suitable habitat or documented occurrences in the Project Area (USDA Forest Service 2007i, 2007j). Two populations of *Ptilidium californicum* and one population of *Cypripedium montanum* are known within the Project Area. These species, also listed as Sensitive, will be protected as discussed above under Sensitive Plants. Species specific Management Recommendations will be met for both species through the application of protective buffers (USDA Forest Service 2007j). The effects to these species will be same as above, in all the alternatives in this project, and will not be addressed further.

3.6.3.3 Noxious Weeds

No known noxious weed populations are within or immediately adjacent to the Project Area. Yellow starthistle (*Centaurea solstitialis*) is present along access roads approximately 3/4 mile from the Project Area. Proposed project activities may introduce noxious weeds into the Project Area, primarily through seed transport on project related vehicles and creation of disturbed areas with little canopy and vegetative cover.

Effects of the No Action Alternative

In this alternative, no commercial thinning, fuels reduction activities, pre-commercial thinning or roadwork would be implemented to accomplish project objectives. Stand development and fuel dynamics currently occurring in the Project Area will continue. The effects to noxious weeds in this alternative are related to the increased risk of wildfire that would result from the No Action alternative. Excess fuel levels would not be reduced in this alternative.

There is a higher risk of noxious weed invasion from the effects of a stand replacing wildfire that could reduce the level of live canopy cover and ground cover levels. Because the one known site of a noxious weed is located approximately 3/4 mile outside the project boundary, this increased risk would still be low. Yellow starthistle is not likely to be transported this distance in the event of a wildfire. There is an overall low risk of noxious weed introduction and spread from this alternative and a low potential for direct, indirect, or cumulative effects (USDA Forest Service 2007k).

Effects of the Action Alternatives

In these alternatives, adequate overstory and understory vegetative cover and ground cover levels will be retained, which will minimize the risk of noxious weed introduction and spread within the Project Area. Because the one known site of a noxious weed is located approximately 3/4 mile outside the project boundary, there is a low potential that this species may spread. Yellow starthistle is not likely to be transported this distance through project activities. Standard mitigation measures to prevent the introduction of weed sources, including equipment cleaning and weed-free seed and straw, have been incorporated into the Project Design Features. The Project Area will be monitored after the project is implemented, and any new sites discovered will be incorporated into Forest mitigation measures as needed. Overall, there will be a low risk of noxious weed introduction and spread from this alternative, and a low potential for direct, indirect, or cumulative effects (USDA Forest Service 2007k).

3.7 Social

3.7.1 Analysis Methods

A social analysis uses social science information to determine how proposed actions affect humans. Because changes in the management policy of the Forest established by the LRMP are not proposed, the social effects of this single proposal are limited in scope. For the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project, effects to social values are discussed in narrative form. Indicators of the social environment are: economics, local community capacity, visual quality (scenery), recreation, air quality, human health and safety, roadless areas, Wild and Scenic Rivers, transportation, heritage resources, environmental justice, a Special Interest Area, and forest management values.

The following series of documents provided information for the social analysis and are on file in the project record:

- Economic Analysis (Young 2006)–includes background information, the assumptions and results of modeling, and the economic effects
- Social Assessment (Perrochet and Boland 2007)–includes a discussion of the social environment, pertinent laws and regulations, and an analysis of the effects of the alternatives on community capacity, values, environmental justice, and human health and safety
- Addendum to the Social Assessment (Stresser 2008)–includes a discussion of the social environment, pertinent laws and regulations, and an analysis of the effects of the Preferred Alternative on community capacity, values, environmental justice, and human health and safety

- Scenery Analysis (Mosier 2007a) and the Addendum to the Scenery Analysis (Mosier 2007b)–evaluates the effects on scenery from sensitive viewpoints and proposed activity areas, based on field studies and interpreting photography
- Recreation Report (Kraus 2006) and the Addendum to the Recreation Report (Mosier 2007c)–describes the existing situation for and analyzes effects on recreation, particularly roads, dispersed camping, and the Pacific Crest National Scenic Trail
- Air Quality Assessment (Snavely 2007b) and the Amended Air Quality Assessment (Snavely 2008a)–provides background information on air quality as well as modeling and analyzing the effects on air quality
- Engineering Report (Davis 2007) provides information on road management, proposed road work, and the effects of road work on the transportation system.
- The Watershed Report (Snavely 2007a) and the Addendum to the Watershed Report (Snavely 2008b) which address the effects of the project on water and beneficial uses.
- The Wildlife Report (Johnson 2007) and the Addendum to the Wildlife Species Report (Johnson 2008) was conducted by the USFWS that addresses the purpose and need for the project and the effects of forest management relative to wildlife and habitat fragmentation.

3.7.2 Affected Environment

3.7.2.1 Economics

The assessment area for economics is the seven surrounding counties including Siskiyou, Shasta, Humboldt, and Del Norte in California as well as Jackson, Josephine, and Klamath in Oregon. Contractors from the seven counties perform work, including: logging, planting, precommercial thinning, masticating, and conducting surveys. These people spend money on gas, equipment, clothing, and food, which creates a small multiplier effect in Siskiyou County. People employed by non-profit groups also work in the seven-county area. Activities such as grazing, hunting, and recreational use also occur in the Project Area and can generate direct or indirect employment that can be cumulative when combined with employment generated by project activities.

3.7.2.2 Community Capacity

Community capacity (the community's ability to respond to stresses and take advantage of opportunities to meet community needs) is fluid. The infrastructure (underlying framework) in the town of Klamath River and most of the surrounding communities is limited and unemployment and poverty is high (Doak and Kusel 1997; Charnley et al. 2005). In the Ashland and Medford, Oregon communities, housing construction, a University, and the arts and entertainment sector bolster

employment opportunities. Appendix F discusses the community capacity for the communities in about a 50-mile radius of the Project Area.

3.7.2.3 Scenery

The geographic scope of the scenery analysis includes the Mt. Ashland LSR Project Area plus small portions of adjacent viewsheds within approximately 1.5 miles from that boundary. Scenery was evaluated for the Project Area overall, and several viewsheds in or near the Project Area, including Interstate 5, the Pacific Crest National Scenic Trail, Siskiyou Crest Road, Mt. Ashland Recreation Area and the Beaver Creek-Mt. Ashland Road.

People value the Scenic Character within the Project Area for its rugged mountain landforms, diverse mixed conifer forest vegetation, and scattered high elevation mosaics of conifer forest, meadows, and rocky ridgelines. The LRMP (USDA Forest Service 1995a) contains goals to perpetuate the ecologically established scenic character of the Forest, and limit visible disturbance to it through Visual Quality Objective thresholds. Most of the Mt. Ashland Project Area has a Partial Retention Visual Quality Objective, intended to provide attractive, forest scenery where activities remain visually subordinate. Highly attractive upper elevation “crest” scenery enhances views from the Pacific Crest Trail, Siskiyou Crest Road, and Mount Ashland Recreation Area. These areas have a Retention Visual Quality Objective threshold, to maintain their attractive, natural appearing scenic character, where activities remain unnoticed. Visual Quality Objectives are to be achieved within three years of project completion (Mosier 2007a).

3.7.2.4 Recreation

Recreation use is moderate throughout much of the drainage, but use is concentrated in specific areas during certain times of the year. The Pacific Crest Trail, a National Scenic Trail, crosses the northern portion of the watershed and is an important recreational feature. Trail use is light during the spring and early summer; however, from mid-July to the end of August, more hikers, including those walking the entire trail in one year, traverse this section. In 2002, 200 hikers were recorded walking the entire trail; daily use ranged from five to ten hikers in the peak period. The Jefferson Scenic Byway (Highway 96) crosses the watershed near the mouth of Beaver Creek. The Siskiyou Crest attracts a multitude of day and weekend visitors to enjoy sightseeing, driving for pleasure, photography, bird watching, picnicking, hiking, horseback riding, camping and cross country skiing. Numerous deer hunters use the many miles of open road during the fall, camping in dispersed sites throughout the drainage. Off-road vehicle use occurs only occasionally here, due to limiting steep terrain. Winter sports include cross-country skiing, snowmobiling, snow shoeing, and snow play from December through May. The Project Area contains two small developed recreation sites that

support recreation activities through all four seasons, the Mt. Ashland Campground and the Grouse Gap Shelter. The Mt. Ashland Ski Area serves skiers and snow boarders who enjoy the slopes both within and outside the Project Area. Winter snows close upper elevation roads in the Project Area, offering unique solitude opportunities for cross-country skiers traveling west of Grouse Gap. The presence of roads and traffic preclude summertime potential for extended solitude.

3.7.2.5 Air Quality

The Project Area is located in northern Siskiyou County, California, and southern Jackson County, Oregon. In California, the Project Area is within the Northeast Plateau Air Basin whose boundary ends at the state and county border. The Northeast Plateau Air Basin includes all of Lassen, Modoc, and Siskiyou Counties and is the fourth largest air basin in the state. The Medford-Ashland area (Rogue Valley) is part of the Medford Air Quality Management Area. The Mt. Ashland LSR Project Area is located about 10 miles south of the Medford Air Quality Management Area. The assessment area for air quality is Siskiyou County. Air Quality in the Project Area is very good. Dust from logging and recreational use of roads is the primary source of particle emission on a day-to-day basis. While occurring only occasionally, wildland fire and prescribed burns are the emission sources with the greatest effect on air quality and human health. For example, smoke caused by wildfires in 2006 completely obscured Mount Shasta, Goosenest Mountain, and Highway 5 during a field review on September 30, 2006. All these attributes were clearly visible during a field review on July 6, 2006 (Perrochet pers. obs. 2006). The project analysis addresses air quality standards for both California and Oregon.

3.7.2.6 Human Health and Safety

The assessment area for health and safety is the Project Area. A number of laws and regulations to protect human health and safety govern forest practices, including the Federal Highway Safety Act, Occupational Safety and Health Administration regulations, and air quality regulations.

3.7.2.7 Roadless Areas

The Project Area is not within an inventoried roadless area.

3.7.2.8 Wild and Scenic Rivers

The distance (considering all Alternatives) between the proposed activities and the Wild and Scenic Klamath River is approximately 9.25 miles upstream on Beaver Creek in the Deer-Beaver Creek 7th

field watershed. Water drafting will not occur in the Klamath River for this project. The action alternatives will not affect the Klamath River.

3.7.2.9 Transportation

The assessment area for the transportation system is the Project Area. The road network provides access for management activities, human uses, recreation, fire-fighting, and other emergency responses. A Forest goal is to provide an economical, safe, and environmentally-sensitive transportation system, emphasizing road maintenance and restoration over new road construction where appropriate. The road system in the Project Area has been evaluated at the Forest, watershed, and project scales (USDA Forest Service 2002c, app. E; USDA Forest Service 2002d; Burkhart and Davis 2007). The three analyses and a project specific road reconnaissance generated recommendations for the desired road network within the Project Area and along the likely haul route.

3.7.2.10 Heritage Resources and Tribal Uses

The assessment area is the Project Area. No designated cultural areas (Management Area 8 in the LRMP) are within or near the Project Area. The Cultural Resource Compliance Process, mandated by 36 CFR Part 800 of Section 106 of the National Historic Preservation Act, requires special review of undertakings that could affect properties included or eligible for inclusion in the National Register of Historic Places. Archaeological field inventories were conducted in the Project Area and are recorded in Archeological Reconnaissance Report ARR-05-05-1651. Relevant archaeological sites have been identified and will be protected by applying standard resource protection measures in or adjacent to the Area of Potential Effect. This is in compliance with 36 CFR 800.1 – 800.4 for the portion of the Project Area in Oregon, and with Region 5 Programmatic Agreement for Compliance with Section 106 of the National Historic Preservation Act (Provision III. D. [2]) for the area in California. Federally recognized tribes were contacted early in project planning, but did not identify any concerns or specific cultural use areas (Refer to Section 1.9). This area has not been identified as an area of special spiritual interest, per the Forest heritage specialist's coordination with tribes in the area.

3.7.2.11 Environmental Justice

Executive Order 12898 relating to Environmental Justice requires Federal agencies to consider disproportionately high and adverse environmental effects on minority and low-income populations. It also requires that minority and low-income populations be given access to information and

opportunities to provide input to decision-making on federal actions. This assessment was conducted using the format described in the Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (USDAF 1997). The assessment area for Environmental Justice is Siskiyou County, California, and Jackson County, Oregon because these two counties are the geographic-political area that would encompass the "footprint" of the area impacted by the Proposed Project (also called the Community of Comparison).

Census data was obtained from the U.S. Census Bureau (2007b) which showed that the population of Siskiyou County is made up of Caucasians (82%), Hispanics (9%), Native Americans (4%), African Americans (1.4%), and Asians or Hawaiians (1.4%) (2005 data). Approximately 15.5% of the population is below the poverty line (2003 data). The population of Jackson County consists of Caucasians (87%), Hispanics (8%), Native Americans (1%), African Americans (1%), and Asians or Hawaiians (1.5%) (2005 data) and approximately 13.3% of the population is below the poverty line (2003 data).

The area potentially impacted by the project includes the Beaver Creek 5th-field watershed and the nearest communities along the Klamath River. There are 30 year-round residents living within the Beaver Creek 5th-field watershed (USDA Forest Service 1996b) and the town of Klamath River is 10 miles downstream of the Project Area. Census data from 2000 (U.S. Census Bureau 2007a) was obtained for zip code 96050 which included Klamath River. Data shows that the local population consists of Caucasians (90%), Hispanics (6%), Native Americans (2.4%), African Americans (1.3%), and Asians or Hawaiians (.6%) and approximately 29.9% of the population is below the poverty line.

3.7.2.12 The Mt. Ashland/Siskiyou Peak Botanical Special Interest Area

The Mt. Ashland/Siskiyou Peak area was designated as a Botanical Special Interest Area in the LRMP. It was designated for the rare and endemic plants in the Crest Zone community. Special Interest Areas are managed for recreational experiences where education and interpretation of the unique or special natural resource values are emphasized. Direction for Special Interest Area can be found in the LRMP on pp. 4-117 through 4-120. The assessment area for the Special Interest Area is its mapped boundary. There are no geologic Special Interest Areas within the Project Area.

3.7.2.13 Forest Management Values

During scoping, two main social values related to forest management surfaced.

1. Maintaining certain existing conditions in the landscape. Specific concerns included:

   a. Protect old growth trees;
   b. Avoid cumulative watershed effects (water quality);
   c. Avoid fragmentation of habitat;
   d. No road construction; and
   e. Maintain a pleasing visual appearance.
2. Manage natural resources wisely. Specific concerns included:
   a. Encouraging the use of fire to reduce fuel loading; and
   b. Thinning treatments should protect the largest and oldest trees with the best likelihood of contributing to desired late-successional forest structure.

The project development was based on the NSOs' need for mature habitat in Northern California, the conditions of Westside LSRs, and a concern about the high risk of stand-replacing fires in the Beaver Creek watershed. The USFWS Yreka Field Office and the KNF began looking for opportunities to improve mid-successional stands in LSRs early in 2004 to accelerate development of late-successional characteristics. An interagency team analyzed Westside LSRs to determine priorities for treatment (Westside LSR Team 2004). The team consisted of USFWS Wildlife Biologist Dave Johnson, KNF Wildlife Biologist Sue Stresser, KNF Fuels Specialist Jeff Keiser, and KNF Silviculturist Carl Varak. The majority of the southeastern portion of the Mt. Ashland LSR was railroad logged by private timber companies from the 1910s through the 1920s. The USFS also logged the area several times from the 1950s through 1980s. Due to this logging, many stands in the LSR are dominated by mid-successional and early-successional pole stands that are young enough to respond favorably (accelerate development of late-successional characteristics) to density reduction such as thinning. Over time, thinning produces larger trees than in unthinned stands (Kramer and Kozlowski 1960; DeBell et al. 1997). The team found Mt. Ashland LSR to be a high priority for habitat restoration and recommended it for treatment.

Mt. Ashland LSR is also a high priority for treatment because of fuel conditions. Fire suppression since the 1920s caused many mid-successional stands to have denser stocking than would have been found historically. The stand densities exceed the site capacity to support vegetation and are not sustainable. Surface and live ladder fuels have also accumulated from the suppression of frequent mixed-severity fires that characterize the Klamath Mountains (Taylor and Skinner 1998). The stands are currently at risk for high rates of tree death and burning at stand-replacing intensities in a fire. "Mid- and upper slope positions often experience higher fire intensities than lower slopes due to preheating of fuels, higher effective windspeeds, and lower canopy cover" in the Klamath Mountains (Taylor and Skinner 2003). The Project Area has an upper slope position.

The *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a), *KNF Forest-wide Late Successional Reserve Assessment* (USDA Forest Service 1999), and the *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b) all identified thinning of previously logged, mid-successional stands as a priority. Fire suppression has resulted in high fuel loading and

white fir encroachment. White fir is less fire-resistant than the ponderosa pine, sugar pine, and Douglas-fir it is replacing (Taylor and Skinner 2003). Fuels reduction, mainly removal of small diameter material, was also identified as high priority in the three documents. "[F]uel treatments that reduce fire severity in portions of the landscape where human activities have increased available fuel will address the problem of unnaturally high fire severity" (Odion et al. 2004).

Fuel breaks were also identified as important in the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a) and *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b) to break up fuel continuity and provide control lines. The team felt this would be critical to protect treated stands. Based on the analysis conducted by the Westside LSR Team, the USFWS and KNF determined the Mt. Ashland LSR was a high priority for habitat restoration in 2005 and 2006.

3.7.3 Environmental Consequences

3.7.3.1 Alternative 1 – No Action

Economics

Timber or biomass from the Project Area would not be available to regional markets and demands will be satisfied by other domestic or foreign sources. Contract work from awarded timber sales, stewardship contracts, road contracts, and survey work would not be realized. Conversely, there would be no costs associated with hazardous fuels reduction and no funding needs for density reduction in mid-successional stands.

Community Capacity

With the No Action Alternative, the future social situation in the vicinity of the project would likely be similar to the present. Community capacity and infrastructure would remain limited, and unemployment and poverty would remain high where it is currently high. Contract work from awarded timber sales, road contracts, silvicultural work, non-profit organizations, and survey work would be on-going. Residents, including Native Americans, may benefit from some of these contracts. There would be no new contribution to contract work in either the local communities or the seven-county area from this alternative.

Scenery

Overall scenery effects of the No Action Alternative are mixed; no new visible disturbances would be created, yet the valued scenery would continue to decline in attractiveness and resiliency. "Scenic

Stability" effects of the No Action Alternative are widespread and adverse throughout most of the Project Area. The No Action Alternative would maintain and prolong the currently diminished scenic character, with its excess of overly dense stands of smaller and intermediate trees, and shortage of large trees within more open stands and scattered small (1–5 acre) openings. Since much of the Project Area has missed several cycles of natural wildfires, the No Action alternative would also prolong the substantial risk of wildfire creating excessively large and concentrated forest canopy openings. These events could greatly alter the canopy pattern and overall scenic character of the Project Area. No "Scenic Integrity" effects (visible disturbances) would directly result from the No Action Alternative. The sensitive viewsheds would continue to display the same largely natural appearance within National Forest lands as directed by the LRMP, along with some stronger visual disturbances on private lands. The No Action Alternative would increase the likelihood of future strong visible disturbances such as uncharacteristically large, unnatural appearing forest canopy openings and salvage logging evidence that often results from wildfire events.

Recreation

Alternative 1, No Action, would have no effect on recreation resources in the Project Area. Recreation opportunities would not be altered. The No Action Alternative would best satisfy Recreation Opportunity Spectrum factors in the short term by not producing any additional evidence of humans, thereby maintaining the semi-primitive ROS conditions along the Siskiyou Crest. However, the recreation setting of the Crest and Project Area would remain threatened by high wildfire risk.

Human Health and Safety

Short-term risks to human health and safety are not expected to change from the current condition with the No Action Alternative. However, increasing fuel loads in the Project Area would increase fire hazard, and any stand-replacing fire in the Project Area would have the potential to move to the other areas of the watershed where community members live, over the Siskiyou Crest, and/or toward the Mt. Ashland Ski Area.

Air Quality, Transportation, Heritage Resources and Tribal Uses , Wild and Scenic Rivers, and Roadless Areas

Alternative 1 would have no direct, short term impact on these types of values. In the long term and in the event of a stand replacing fire, air quality would be the most directly affected of these value elements and roads may have to be built for fire suppression (relative to the Transportation value element). There would be no change to Inventoried Roadless Areas because there are no inventoried roadless areas in the Project Area. Regarding the Wild and Scenic River, the Klamath River could potentially be affected by a large scale fire if sediment delivery was increased beyond functional

capability of the watershed. Heritage resources and tribal uses may be impacted by a large scale fire, especially where historic wooden objects or wooden structures are present.

Environmental Justice

The lack of new work opportunities could affect individual members of local communities and/or the two-county area. Census data for the census tract representing the local population shows that the local population has a higher percentage of low-income people compared to the Community of Comparison (29.9% vs. 15.5%) (Perrochet and Boland 2007). No adverse environmental effects will occur as a result of implementing this Alternative but the local population may be disproportionately negatively affected by the lack of work opportunities.

Mt. Ashland/Siskiyou Peak Botanical Special Interest Area

This Alternative will not affect the Special Interest Area. Three endemic species of special concern inhabit the dry, open, gravelly, granitic slopes along the Siskiyou Crest within the Special Interest Area: *Horkelia hendersonii, Lupinus aridus* ssp. *ashlandensis,* and *Tauschia howellii.* Because these species grow on decomposed, granitic, barren areas there is a low likelihood of impact by wildfire.

Forest Management Values

Those who are opposed to forest management would favor this alternative. Those who value creating job opportunities, including those employed by fuels reduction work and those who bid on service contracts, would not support this alternative. Some people may think that this alternative is not wise management of the Project Area because it does not restore and protect late-successional forest or reduce wildfire risks as described as Desired Conditions in the LRMP, the *KNF Beaver Creek Ecosystem Analysis* (USDA Forest Service 1996b), and in the 2006 Business Plan for the KNF. Those that wish the forest to remain ‘as-is’, would not like this Alternative because the forest is a dynamic system and will continue to change, moving through typical western forest successional vegetative conditions.

The No Action Alternative would not implement direction in the LRMP to provide the highest net public benefit (USDA Forest Service 1995c, ii).

The No Action Alternative would respond to values associated with maintaining existing conditions. It would result in no management actions occurring on the landscape, which is important to some. However, it may not result in protecting old trees, water quality or pleasing scenery in the event of a wildfire. The No Action Alternative would not respond to values associated with reducing fuel loading or thinning to promote development of late-successional forest.

3.7.3.2 Action Alternatives: Alternatives 2, 4, 5, and the Preferred Alternative

Alternatives 2, 4, 5, and the Preferred Alternative are similar in their potential effects on social elements, so are discussed together.

Economics

Implementation of any of the action alternatives would result in economic benefits to the local economy through use of timber sale contracts, stewardship contracts, use of local USFS personnel or equipment, or a combination of the above, to accomplish project objectives. The economic benefits from this project could go to either Oregon or California or both depending on markets, mill capability, and location of biomass facilities. Based on modeling (Young 2006), wood products would be provided to support local mills and supply markets within the assessment area as follows: approximately 15.7 million board feet in Alternative 2, 13.6 million board feet in Alternative 4, 15.2 million board feet in Alternative 5, and 14.6 million board feet in the Preferred Alternative. The jobs attributed to this volume are estimated as 157 jobs for Alternative 2, 136 jobs for Alternative 4, 152 jobs for Alternative 5, and 146 jobs for the Preferred Alternative.

Revenue generated from the sale of wood products would offset the cost of conducting habitat restoration and fuels treatments. However, preliminary model estimates (without cruise data) based on market conditions as of October 2006 (ibid.) show that additional funding would be needed to complete the proposed actions as follows: Alternative 2 would cost an additional $466,467, Alternative 4 would cost $287,147, Alternative 5 would cost $626,752, and the Preferred Alternative, including 1,297 additional acres of underburning, would cost roughly $456,400. The non-commodity values relating to stand health, the ecosystem, and stand sustainability are discussed earlier in this chapter.

Community Capacity

With these alternatives, the future social situation in Beaver Creek area would likely be similar to the present. Available contract work, including service contracts, and work with non-profit groups would increase in the short-term. Estimated jobs attributed to logging and/or stewardship contracts are displayed above and in the Economic Report. Any Action Alternative would include a temporary increase in employment, which could directly provide economic benefit to some local residents in this line of work. Small, short-term, indirect benefits might accrue to local residents if they work in support industries in the County. None of these employment effects would be substantial enough to noticeably improve community capacity. The cumulative effects of these short-term increases combined with other work available in the communities and in the seven-county area could add up to full time employment for a limited number of people. In the event that the Mt. Ashland Project and

similar forest restoration projects are successful in providing small trees and slash from thinning of over-dense forest stands to the local market, there could be an improvement in the infrastructure needed to process and utilize wood biomass, resulting in a positive effect on community capacity.

Scenery

Overall scenery effects of the Action Alternatives are mixed. Minor visible disturbances would result from activities proposed across much of the Project Area; however, these activities would also reverse the current widespread decline in scenery attractiveness and resiliency within these same areas, and beyond. "Scenic Stability" effects of the action alternatives on the valued scenic character and its scenic vegetation attributes would be widespread and favorable throughout most of the Project Area. Because the proposed thinning and fuels treatments affect one-third of the total acreage of the Project Area within priority stands and major ridgelines, the action alternatives would immediately enhance the currently diminished scenic character to a moderate degree within the treatment areas, and increase its ecological resiliency within the Project Area for several decades to come. The Preferred Alternative's scenery effects vary from the other Action Alternatives, by providing the greatest overall sustainability of the valued scenic character through a substantial increase in fuel reduction activities in strategic locations as well as a similar level of scenery-beneficial thinning activities. Scenic Integrity (visual disturbance) effects of the Action Alternatives would typically be minor but widespread across the Project Area and within its sensitive viewsheds. The Preferred Alternative excludes proposed thinning and fuels reduction activities in areas near the Pacific Crest Trail and Siskiyou Crest Road, thereby avoiding scenery disturbances in these sensitive immediate foreground views. Refer to the Mt. Ashland Project Scenery Analysis (Mosier 2007a) and the Addendum to the Scenery Analysis (Mosier 2007b) for a more detailed discussion of how scenery would be affected.

Recreation

Klamath LRMP direction to achieve "semi-primitive" or "roaded-natural" ROS (Recreational Opportunity Spectrum) Class conditions (USDA Forest Service 1986) will be fully satisfied. ROS attributes such as evidence of humans, recreation facilities, social encounters, and distance to roads would remain consistent with that direction. The Action Alternatives would substantially reduce the wildfire risk, while producing some additional evidence of human disturbances, yet those disturbances would be limited by project design features to retain semi-primitive conditions within the Siskiyou Crest. Alternatives 2-5 would produce some minor and adverse evidence (logging associated disturbances) along some segments of the Pacific Crest Trail, Siskiyou Crest Road and Beaver Cr to Mt Ashland Road. The Preferred Alternative however, would not alter the Pacific Crest Trail and Siskiyou Crest Road settings by avoiding treatments in this area.

Operational impacts of the project activities proposed within the Action Alternatives include temporary adverse recreation effects of industrial traffic, noise and dust. No significant long-term impairments to recreation settings and opportunities, or recreation use levels would occur with any of the Action Alternatives (Kraus 2006) (Mosier 2007c). It is not expected that recreation use will measurably increase or decrease because of the proposed project. Changes in stand structure, composition and overall forest resiliency resulting from the Action Alternatives would be moderately beneficial to the Project Area's recreation settings for both dispersed and developed recreation, in terms of both ecological stability and scenic attractiveness. Of these alternatives, the Preferred Alternative most robustly restores ecological and scenery conditions in the Project Area, thereby providing the greatest benefit to its recreational settings. For more information about these effects, refer to the Mount Ashland Project Scenery Analysis (Mosier 2007a) and Addendum (Mosier 2007b), which contains specific effects information about the Siskiyou Crest, Pacific Crest Trail and other areas typically frequented by recreation visitors. Indirect benefits of the recreation improvements above would also enhance local quality of life and tourism economics."

Human Health and Safety

The action alternatives would avoid adverse effects to public safety through expert project design consistent with laws and regulations. All action alternatives would include standard public health and safety clauses in all contracts and agreements. Standard precautionary measures would be used, such as dust abatement, using signs to identify areas of concentrated road use, safely securing truckloads, and maintaining the haul route. There is no pesticide use proposed in this project.

The Air Quality Design Features would minimize the potential for air quality effects on public health due to pile burning. Masticating/grapple yarding rather than burning fuels on 809 acres in Alternative 2, on 617 acres in Alternative 4, on 745 acres in Alternative 5, and on 1,037 acres in the Preferred Alternative would also help limit potential emissions and reduce adverse effects on public health. Emissions would be consistent with State and Federal air quality standards as discussed in the Air Quality Report. Due to the reduced available fuels, particulate emissions in treated areas in the event of a wildfire would be reduced, compared to the No Action Alternative, minimizing the risk of adverse effects on human health.

Felling hazard trees will provide for public safety on USFS roads, consistent with the requirements of the Federal Highway Safety Act and the Occupational Safety and Health Administration regulations. Hazard trees will be identified using the Klamath Hazard Tree Guidance (USDA Forest Service 2001a).

Air Quality

The action alternatives will generate dust, primarily from hauling material during restoration and fuels reduction activities. Road maintenance and road decommissioning will also emit particulates for short periods while the activities occur. Dust abatement plans will be included in contracts, so road-related activities, including hauling, generally occur when some moisture is in the road soil. Dust abatement protects public health and safety, protects the road surface, minimizes dust on vegetation and in streams, and reduces road-related erosion. The air quality design features will minimize the potential for direct effects on air quality and indirect effects on public health due to pile burning or underburning. Piles will be burned in late fall when weather would not allow underburn or broadcast burning. Underburning will occur over a 5-year period after timber harvest activities have been completed in an area. Hand pile burning will occur during the fall when weather will not allow underburns or broadcast burning. Handpiles will be covered to keep dry. Emissions of smoke during prescribed burning may reduce the visibility in some locations but implementation of smoke management practices and plans, burning during favorable weather conditions when smoke is carried away from Class I and II airsheds and other sensitive areas, and using the best available fire and emission control measures will minimize visibility impairments. Unpleasant odors and visibility impairment may be temporarily detected by Wilderness visitors and residents of local communities.

PM10 and PM2.5 emissions from prescribed burning would contribute to local, air basin and broader regional pollutant loading. Local and air basin effects would include cumulative prescribed burn emissions from Federal, State and private lands in the area. The action alternatives are not expected to exceed 24-hour or annual State and Federal Standards and will not degrade air quality or attainment status in the area (Snavely 2007b, 2008a).

Hauling is expected to occur over a four year period. Emissions were calculated for a worst case scenario (dry roads due to no rainfall). Annual emissions for each of the action alternatives is calculated to be 7.7–8.8 tons. Dust emissions from hauling will add to the PM 10 locally and regionally. However, fugitive dust emissions, dispersion and transport will be mitigated by treating selected main unpaved haul routes with water and or chemical dust suppressants thereby reducing overall dust emissions and cumulative effects from the project activities. Dust abatement methods are estimated to reduce total emissions from 50% to 80% of the worst case estimate (EPA 1998). Surface improvements such as adding aggregate will also reduce overall emissions.

Transportation

All of the action alternatives will have similar effects on the transportation system except as indicated. Maintenance of haul roads for the project will improve driver safety and comfort by clearing, blading, and dust abatement where required for treatment access or haul. Clearing roadside vegetation will improve visibility. Blading will remove rocks and debris from the road surface and

smooth the road surface. These improvements will contribute to public safety for several years after the project. Dust abatement will improve user safety on gravel and native surfaced roads during project implementation. However, the increased truck and heavy equipment traffic during the implementation of the project will make the haul routes more hazardous during the life of the project. In summary the action alternatives are equally more likely to improve user safety and comfort in the years after the project than the No Action Alternative, which depends on routine maintenance as funds allow to accomplish maintenance work.

Decommissioning the one system road 40S20 will not effectively reduce access in the Project Area. 40S20 is currently impassible approximately 0.25 miles from its junction with the 20 road. Year-round closure of system roads which have been open will restrict some public access in the Project Area, notably at the upper end of the Long John Creek 7th-field subwatershed where five dead-end spurs have been proposed for year-round closure under all action alternatives: 40S09, 40S10, 40S13A, 40S15A, and 40S16A, totaling 8.8 miles. These roads have low recreational use, with a few historic hunter camps. Many of these roads have been heavily overgrown and only recently opened up by thinning projects. The tie through roads in this area, 40S06, 40S13, 40S15, and 40S16, will remain open. Of the roads proposed for year-round closure, only 41S13 has been closed in the past. It accesses private land and is under special use permit to the land owner. It is located at the lower end of the Beaver-Grouse Creek 7th field watershed and is 0.5 miles long. Existing unauthorized roads used by the project and not needed for long-term management will be decommissioned; temporary roads constructed by the project will also be decommissioned. Alternative 2 will decommission 22 roads, Alternative 4 will decommission 17 roads, Alternative 5 will decommission 10 roads, and the Preferred Alternative will decommission 9 roads.

Including unauthorized roads on the system provides access for this project and also for long-term management. Four existing roads and road segments would be included in the system under all action alternatives: 40S06.2 (this road will remain closed to public year-round as it is now), 40S16.1, 40S16.6, and 41S15.1. Placement on the system would provide the mechanism and means to manage these roads and mitigate any potential resource issues.

Prior to project implementation, a Traffic Control Plan will be developed that provides for public safety on USFS controlled roads and trails open to public travel. Hazard tree removal, a non-discretionary action, will meet Occupational Safety and Health Act standards for hauling, landing use, tree falling, and associated actions. Hunters will be informed well in advance of hunting season about the project and potential impacts to hunting and camping, including road conditions and closures.

The widely dispersed traffic and noise from thinning and fuels reduction activities and transporting workers, equipment, and materials could disturb people in the short-term. Visitors using roads in the

vicinity of project work may choose to avoid the area and use other parts of the Forest for a short period of time to avoid the noise and traffic delays. The construction of spur roads would not increase or restrict traffic in the area because they are in short segments and will be decommissioned at the end of the project.

Heritage Resources and Tribal Uses

The Action Alternatives will not have significant negative effects on archaeological objects or known cultural sites of archaeological significance or cultural importance with implementation of the following conservation measures:

- Archaeological objects or known cultural sites of archaeological significance or cultural importance will be protected by flagging and avoiding sites.
- Underburning at low intensity will be allowed through Site #181 (Oregon trinomial 35JA00704) and is not expected to have significant negative effects on the site. Post-project monitoring will occur at this site. Underburning may have beneficial effects by exposing additional sites for recording and preserving.
- Site #85 (Oregon trinomial 35JA00695) will be protected by placing logs parallel and within the ditch and at a height level with the rim of the ditch at any proposed crossing sites.
- Site #182 (Oregon trinomial 35JA00706) may be affected by tractor yarding followed by prescribed fire, however, this site is not eligible to the NRHP.

Any other objects or sites discovered during implementation will be protected, including: historic or prehistoric sites, buildings, objects, and properties related to American history, architecture, archaeology, and culture. The USFS will modify or cancel a contract to protect an archaeologically significant cultural area, object of antiquity, artifact, or similar object. The operator is required to promptly report any new discovery.

Native Americans did not identify any potential conflicts or special contemporary uses during scoping; therefore, it is expected that the risk of disturbing contemporary native use sites is low. It is not anticipated that an action alternative will adversely affect contemporary Native American uses or values.

Wild and Scenic Rivers, Roadless Areas

The action alternatives would have no effect on Wild and Scenic Rivers because there is no effect on the outstanding remarkable values associated with the designation, which is anadromous fish or water quality in the Klamath River (B. Thomas 2007a; USDA Forest Service 2006f).
There would be no change to Inventoried Roadless Areas because there are no inventoried roadless areas in the Project Area.

Environmental Justice

Based on the analysis of environmental effects in Chapter 3, Alternatives 2, 4, 5, and the Preferred Alternative would have no adverse effects on human health or the environment that are significant, unacceptable, or above generally accepted norms. Although there are modeled negative cumulative watershed effects, there will be no adverse effects to domestic water sources or fish (refer to the Water Quality discussion). Census data for the local area suggests that the percentage of the local population that is minority is equal to or less than the Community of Comparison (two counties) but that there are a disproportionate number of low-income people. Therefore, implementation of Alternative 2, 4, 5, or the Preferred Alternative may have beneficial social effects in that local residents may benefit from the work generated by the project.

The project does not appear to have a disproportionately high or adverse effect on minority or low-income populations. Extensive scoping, as described in Chapter 2, did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or ameliorate adverse effects to these populations have been identified. All interested and affected parties will continue to be involved with the public involvement and decision process.

Because the Project Area has a relatively high road density for the Forest, the decommissioning of one short segment of a system road and several segments of unauthorized roads would reduce motorized access in a few localized areas but would retain motorized access to the majority of the area. This would affect disabled people who need motorized access; however, there is ample opportunity for motorized access in this area. The remaining roads in the Project Area would continue to provide access to the general area. This is not expected to disproportionately affect any group.

Mt. Ashland/Siskiyou Peak Botanical Special Interest Area

The Mt. Ashland/Siskiyou Peak Botanical Special Interest Area is located within the Project Area boundary at the highest elevations and outside of project activity areas. The project has been designed to avoid adverse effects to this Special Interest Area.

Forest Management Values

People have various perceptions on what constitutes a natural or pleasing landscape and what constitutes wise management of natural resources. The USFS Scenery Management System assumes that a pleasing landscape is the proxy most often used by people to judge wise use of resources. Other elements of existing conditions and wise management include maintaining air and water quality, as well as providing habitat for plant, wildlife, and fish species. Refer to Air Quality, Water

Quality, Vegetation, Fisheries, and Wildlife Specialist Reports for a discussion of these values. Those who value no human intervention in the landscape would not support any of the action alternatives unless they view the project as a response to past human activity to meet long term goals for the forest ecosystem.

Each of the Action Alternatives would contribute to implementing the Selected Alternative in the LRMP, which was identified as providing the highest net public benefit and is consistent with the 2006 Business Plan for the KNF, Component 1.5, to "Maintain healthy vegetative condition by controlling density levels, to prevent mortality from insect, disease, drought and fire." More specifically, the Mt. Ashland LSR project is identified as part of the Forest's effort to improve habitats for Threatened, endangered, or Sensitive Species that prefer late-successional forest types. Those who agree with the LRMP provisions and believe one of the action alternatives is the best means of implementing the LRMP in this area will view that alternative as wise management because it leads toward achieving the Desired Conditions. Those who disagree with the LRMP provisions will not view implementing an action alternative as wise management; this includes but is not limited to those who believe allowing natural processes to dominate throughout the entire Forest is the best policy, and those who do not want any trees, any large trees, or any old-growth trees to be cut. Those who agree with the multiple-use provisions of the LRMP, but do not believe any of the action alternatives are the best means of implementing the LRMP will likely not view an action alternative as wise management. The action alternatives will please those who value job opportunities in the area.

The slight scenic alterations to the landscape could adversely affect those who use the Forest for renewal or spiritual practices, although these values were not identified as important in the Project Area during scoping. The noise disturbance will persist for several days in any local area, but could persist somewhere in the watershed over several seasons. In the long term, the public will enjoy the use of the watershed more because the risk of high-intensity fire is reduced and over-all forest health will be improved for late-seral forest habitat dependent species by the action alternatives. The action alternatives would respond to values associated with protecting old trees and late-successional habitat because large trees will be retained as part of the prescription and prescriptions are designed to promote development of late-successional forest. Fuels reduction treatments are designed to reduce the risk of catastrophic wildfire and subsequent loss of forested habitat. Although the effects of treatments are minor, the Preferred Alternative would not respond as well as the No Action alternative for values relating to no road construction, no watershed effects, and no habitat fragmentation. In the event of a wildfire under the No Action Alternative, these values would be more negatively affected than under the Preferred Alternative.

3.8 Short-term Uses 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). As declared by the Congress under NEPA, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

Short-term uses, and their effects, are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act, and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the design features described in Chapter 2, in particular those applying to the soil and water resources.

Harvesting trees in the short term in the action alternatives will reduce stocking levels and reduce insect and disease levels. The resulting stand conditions will be more sustainable over the long term from the standpoints of vegetative diversity and non-declining flow of timber. Treatments are expected to promote the development of larger trees sooner than if left untreated.

All action alternatives will experience a period of increased fire hazard after thinning due to increased surface fuels. Fuels reduction treatments will result in a reduction of both activity fuels and natural fuels, resulting in reduced BA mortality and moderated fire behavior in the event of a wildfire. The degree of reduced effects is variable, depending on the current stand condition, the type of fuels treatment, and the amount of area treated. All action alternatives will improve the chances of a successful direct attack during fire suppression. Reductions in fire behavior will reduce wildfire-related erosion. Reducing the risk of post-fire delivery of sediment to streams at the site and watershed scales will result in long-term benefits to aquatic habitat. Any action alternative will protect aquatic habitat from the effects of future stand-replacing fires, while maintaining the overall functioning of aquatic habitat.

In the action alternatives, road improvement and decommissioning cause short-term risks to water quality from displaced soil, but reduce chronic sediment input to nearby channels and prevent development of new sediment sources. Such activities generally reduce suspended sediment and

turbidity in the long term. Decommissioning also disconnects ditches from streams, resulting in reduced runoff peaks, channel erosion, and sediment delivery to streams in the long term. The road system will be brought closer to the Desired Condition identified in the project roads analysis. Driver comfort and safety will be improved and the road facility protected on a number of roads.
All action alternatives will degrade forested habitat used by NSOs, American martens, and Pacific fishers by a small amount in the short term. Long-term beneficial effects will occur as stands increase in growth rates, canopy closure, and BA. Alterations in scenery will be slightly noticeable in the short term in all action alternatives. The scenic mosaic will have a substantially greater likelihood of being perpetuated than with the No Action Alternative.

3.9 Unavoidable Adverse Effects

Implementation of any action alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Some adverse effects are short-term and necessary to achieve long-term beneficial effects. In the case of this project, some negative effects from implementing the proposed treatments are necessary to obtain the benefits of habitat restoration (achieve late-successional forest sooner than left untreated) and fuels reduction (reduced BA mortality and moderated fire behavior). Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of effects. The interdisciplinary process used to identify specific thinning stands, fuels treatments, and temporary spur roads was designed to eliminate or lessen the significant adverse consequences. The design features, including LRMP Standards and Guidelines, further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects will occur under all action alternatives. Full descriptions of the effects of implementing action alternatives can be found in the previous sections of this Section.

Fire hazard will temporarily increase in all action alternatives after thinning treatments until the fuels treatments are completed due to increased surface fuels. This increased hazard will vary by stand and may be present in some stands for up to five years.

Roadwork, landing construction or reconstruction, and conventional yarding will result in some soil displacement and some reduction in soil productivity. Reduced productivity will occur on approximately 134–144 acres (depending on alternative) dispersed throughout the Project Area. Loss of productivity is long-term, taking more than 100 years to recover. All LRMP Standards and Guidelines and Region 5 Soil Quality Standards to minimize effects on soils will be met.

There will be a negligible increase in the risk of surface erosion. All sediment will be intercepted by vegetated Riparian Reserves and is not expected to reach streams.

There is the potential for minor changes in peak flows, but change in flows will be undetectable at the 7th-field subwatershed scale.

The action alternatives will result in habitat reduction or degradation for NSOs, American martens, and Pacific fishers but the effects will be minimal. Prey habitat components for NSOs will be reduced in the short term, which could alter prey abundance or distribution; the effects are expected to be minimal.

The action alternatives will result in insignificant effects to snag Management Indicator Species by reducing habitat elements in DFPZs or along temporary spur roads. The action alternatives are designed to maintain and promote the development of large trees thus providing recruitment trees for large snags in the long-term.

A wide range of typically subtle scenic integrity disturbances would be scattered across the Project Area and its viewsheds as a result of the action alternatives. These disturbances would all be short term in duration, typically being noticeable for less than five to ten years.

Pile burning and underburning may cause unpleasant odors and short periods of impaired visibility in all action alternatives. Hauling of trees or biomass, yarding, road maintenance, and road decommissioning will emit dust particles for short periods while the activities occur.

3.10 Irreversible and Irretrievable Commitment of Resources

Irreversible commitment of resources refers to a loss of non-renewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors which are renewable only over long time spans or at great expense, or to resources that have been destroyed or removed. No irreversible commitments of resources were identified for the project.

Irretrievable commitment applies to losses that are temporary, such as use of renewable natural resources. The production lost would be irretrievable, but the action would not be irreversible. Under the No Action Alternative, there would be an irretrievable commitment of forest vegetation in the event of a wildfire. Under the Action Alternatives, risk of wildfire and subsequent loss of forest vegetation will be reduced. Vegetation removed as commodity byproducts of restoration and fuels treatments would constitute loss of production of individual trees or groups of trees but would not result in loss of productivity of entire stands of vegetation. Functioning of forest habitats will

continue and conditions are expected to improve (achieve late-successional conditions sooner) within several decades. Under the action alternatives there would be an irretrievable loss of individual trees or groups of trees but not of forest conditions. This impact is in accordance with the management goals and objectives of habitat restoration and hazardous fuel reduction treatments.

3.11 Cumulative Effects

Cumulative effects have been discussed in the individual resource sections earlier in this chapter. Cumulative effects for this project include past, present, and on-going actions. The list of actions considered for cumulative effects analyses can be found in Appendix B, in the Cumulative Watershed Effects Specialist Report (Elder 2006), and in the Addendum to the Cumulative Watershed Effects Specialist Report (Bousfield et al. 2008). Resource specialists considered all of the listed actions but may have used only a subset of the listed actions in their effects analysis based on the potential effects to their resource.

3.12 Climate Change

Increasingly, the relationships between human-caused emissions, climate change, and the role of forests as carbon sinks are being documented (IPCC 2007). Although uncertainty exists in quantifying the impact of emissions on climate, a global warming of 1.4 to 5.8 degrees centigrade is projected by 2100 (USDA Forest Service 2007l). Adapting to climate change and its potential impacts poses challenges and opportunities for managing resources, infrastructure, and the economy (ibid). Forests and rangelands are seen as part of the solution to reducing atmospheric carbon dioxide and other greenhouse gases; however, the magnitude of the opportunity for carbon storage and carbon trading is not well quantified or thoroughly understood (USDA Forest Service 2007l; IPCC 2007).

The use of future climate scenarios and ecological models suggests that the impact of climate change on US ecosystems could include increases in ecosystem productivity in the short term and shifts in the distribution of plants and animals in the long term (Joyce and Birdsey 2000). As climate changes advance, there are some indications that there will be increases in disturbances such as forest fires, drought, and insects (USDA Forest Service 2007l).

Based on the best available science, it is too speculative to factor any specific ecological trends or substantial changes in climate into the analysis of environmental impacts of individual projects. For example, changes in wildlife ranges and habitat in forested environments due to climate change are

not well understood; therefore, such issues are outside the scope of the Mt. Ashland LSR Project analysis. Currently, the best available science concerning climate change is not adequate to support reliable predictions about ecological interactions and trends at the local (site-specific) scale.

In general, based on predictions of a warming climate and increases in disturbances such as insects and wildfire, it is expected that treatments proposed in the Mt. Ashland LSR Project would benefit forests though thinning and fuels treatments designed to reduce stress on trees, increase growth, promote species diversity, favor fire resistant species, and reduce risk of loss due to wildfire.

Managing forests for carbon sequestration is a poorly understood science but utilization of durable wood products and active forest management is believed to be an effective method of carbon sequestration (IPCC 2007). Thinning and fuels treatments will not eliminate fire from the project area, but can help change fire behavior from crown fires to surface fires in an area defined by historic fire frequency of 0-35 years and low intensity surface fires (refer to the Fire and Fuels Section, pp. 3-89), thereby likely reducing carbon dioxide emissions resulting from wildfire.

For more information on the status and trends of the nation's resources and climate change, go to the Research and Development Resources Planning Act Assessment website at http://www.fs.fed.us/research/rpa/.

3.13 Energy Requirements, Conservation Potential, Depletable Resource Requirements

Consumption of fossil fuels will occur with the action alternatives during logging and hauling timber and during the decommissioning of temporary roads. No unusual energy requirements are included nor do opportunities exist to conserve energy at a large scale. With the proper application of the LRMP Standards and Guidelines for soils, soil productivity will be conserved; supporting information can be found in the Soil Report. The project was developed, in part, to promote the conservation and recovery of late-seral-dependent wildlife species, such as the NSO.

3.14 Prime Farmland, Rangeland, and Forest Land

The Project Area does not contain any prime farmland or rangeland. Prime forest land does not apply within the National Forest System.

3.15 Possible Conflicts with Other Land Use Plans

The action alternatives are entirely on National Forest System land. The private land within the 5th field watershed and the small amount within the Project Area are generally managed for timber production and grazing, so conflicts are not likely to occur. The action alternatives are not in conflict with planning objectives for Siskiyou County or local tribes.

3.16 Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

Consultation with the National Marine Fisheries Service and the USFWS has been completed as required by the ESA. As no water impoundments or diversions are proposed, the KNF is not required to consult with the USFWS under the Fish and Wildlife Coordination Act.

Consultation with California and Oregon State Historic Preservation Offices will be completed as required by the National Historic Preservation Act. No properties eligible for the National Register of Historic Places will be affected.

4. CONSULTATION AND COORDINATION

4.1 Preparers and Contributors

The USFS consulted the following individuals, Federal, State, and local agencies, tribes, and other non-USFS persons during the development of this FEIS.

4.1.1 Consultants

Don Elder, Hydrologist. Responsible for the Cumulative Watershed Effects (CWE) modeling and interpretation. Prepared the CWE Specialist Report.

Ecosystem Research Group, Missoula, Montana. Ecosystem Research Group personnel, (the four individuals described below) were involved in the compilation and editing of specialist reports and incorporating them into this FEIS. All technical analyses and project design were completed by KNF Interdisciplinary Team Members.

> **Gibson Hartwell**, Environmental Scientist: 16 years experience in forestry, fire ecology, fisheries, botany, land use planning, and NEPA writing. B.S. Natural Resource Sciences. Responsible for editing and compiling project descriptions, alternatives analysis, and specialist reports into EIS form and consulting KNF team leader on NEPA compliance.
>
> **Mike Hillis**, Wildlife Biologist: 35 years experience in wildlife biology, forest ecology, silviculture and NEPA. B.S. Wildlife Biology. Responsible for editing.
>
> **Melanie Smith**, Environmental Scientist/GIS Specialist: seven years experience in GIS application, mapping, land use planning, and NEPA. B.A. Environmental Studies. Responsible for editing.
>
> **Jon Schulman**, Hydrologist: 11years experience in hydrology, land use planning, engineering, and NEPA. M.S. Environmental Engineering. Responsible for editing.

4.1.2 Interdisciplinary Team Members

Bill Bailey: 30 years experience in timber management with the U.S. Forest Service; expertise in timber management, layout, preparation, and logging systems. Provided input to the economic report, logging systems design and field layout.

Leslie Burkhart: 29 years experience as Civil Engineering Technician, Lands and Special Use Officer; AA Forest Engineering and Forest Management; expertise in roads; responsible for maintaining road work summaries and preparing the Road Analysis Process Report (RAP).

Candice Cook-Slette: KNF Heritage Program Manager; expertise in archaeological reconnaissance and tribal relations; acted as liaison with local Native American tribes and prepared the Heritage Report.

Max Creasy, Ecologist: 23 years experience in vegetation ecology with U.S. Forest Service; BS in Ecology; expertise in vegetation ecology and fire ecology; responsible for FRCC modeling and input to the fire and fuels report.

James Davis: 34 years experience in engineering; BS Wildlife/Fisheries Biology; expertise in road location, design, construction, and management. Responsible for road related input, Roads Analysis Process and Haul Route Analysis.

Juan de la Fuente: 35 years experience in geology; BS Geology; expertise in geomorphic processes; provided input to hydrology report.

Jan Ford: 27 years experience in wildlife, minerals, lands, recreation, planning; expertise in assessing forest management effects on a variety of resources. Responsible for editing.

David Johnson: 8 years experience in wildlife biology with the University of Idaho and USFWS; expertise in ESA consultation; MS in Wildlife Management; responsible for wildlife analysis, wildlife biological evaluation/biological assessment, and consultation under ESA.

Julie Knorr: 28 years experience with the Forest Service, 18 years in botany; BS Botany; expertise in botany; responsible for botanical analysis, noxious weed analysis, plant biological evaluation/biological assessment.

Charles Kraus: KNF Recreation Officer; expertise in recreation management and planning; responsible for the Project Recreation Report.

Tom Laurent: 29 years experience in soil science; BA Geology, MS Soil Science; expertise in soil management, monitoring, and inventory; responsible for soil analysis.

Jerry Mosier: 30 years experience in landscape architecture; BS Landscape Architecture; expertise in scenery conservation and environmental design arts; responsible for scenic quality analysis.

Bill Snavely: 20 years experience in geology and hydrology with the U.S. Forest Service; BA in Geology; responsible for hydrology.

Susan Stresser: 16 years experience in wildlife habitat management; BS Biology; expertise in ESA consultation and wildlife management; acted as Project ID Team Leader.

Brian Thomas: 14 years experience in fisheries habitat management; BS Wildlife Management/Freshwater Fisheries; expertise in aquatic habitat management; responsible for fisheries analysis and fisheries biological assessment.

Richard VandeWater: 17 years experience in GIS with the U.S. Forest Service; MS in Sociology; expertise in GIS and database management; responsible for mapping, database management for the project, and GIS.

Carl Varak: 29 years experience in forestry, silviculture; BS in Forest Management; expertise as certified silviculturist; responsible for silvicultural prescriptions and vegetation report.

Debi Wright: 27 years experience in silviculture, timber, and fuels; college level training in forestry, silviculture, and technical fire management; expertise as certified silviculturist, fuels officer; responsible for fuels report.

Marc Young: 5 years experience in forestry and timber management; BS in forestry; expertise in forestry, layout and logging systems; responsible for logging economics report

4.2 Distribution of the Environmental Impact Statement

This FEIS has been distributed to the following government agencies and to those organizations and individuals who specifically requested a copy of the document. Other parties on the project mailing list were provided with a summary document and notified that the full document is on the Forest website.

4.2.1 Federal Agencies

Advisory Council on Historic Preservation
Agriculture, U.S, Department of
- Animal and Plant Health Inspection Service
- Forest Service, Region 5
- Forest Service, Washington Office,
- National Agricultural Library
- Natural Resources Conservation Service

Commerce, U.S. Department of
- National Oceanic and Atmospheric Administration – Fisheries, Eureka Office
- National Oceanic and Atmospheric Administration – Fisheries, Yreka Office
- National Oceanic and Atmospheric Administration, Office of Policy and Strategic Planning
- National Marine Fisheries Service, Habitat Conservationists Division, Southwest Region

Energy, U.S. Department of
- Office of NEPA Policy and Compliance

Environmental Protection Agency
- Office of Federal Activities
- Region 9

Federal Aviation Administration, Western-Pacific Region
Federal Highway Administration, Western Region
Interior, U.S, Department of
- Office of Environmental Policy and Compliance
- U.S. Fish and Wildlife Service, Yreka Office

Transportation, U.S. Department of
- Office of the Maritime Administration

U. S. Army Engineer Division, South Pacific
NOAA-Fisheries, Donald Flickinger
Rogue River National Forest
U.S. Environmental Protection Agency, Region 10

4.2.2 State Agencies

California Regional Water Quality Control Board, North Coast Region
Dennis Maria, California Department of Fish and Game
Bob Schaefer, California Department of Fish and Game
Fred Jansen, California Department of Forestry and Fire
Mark Vargas/Dan VanDike, Oregon Department of Fish and Wildlife
Vince Oredson, Oregon Department of Fish and Wildlife

4.2.3 Organizations and Individuals

George Sexton, Klamath Siskiyou Wildlands Center
Tom Williams, Northcoast Water Quality CB
Scott Greacen, EPIC
Michigan California Lumber Co.
Jim Ostrowski Timber Products
Fruit Growers Supply Company
Marcia Armstrong, Siskiyou County Supervisor
Klamath Forest Alliance
People for USA
Jeff Bryant, American Forest Resource Council
John and Claudia McDonagh
KARE
Phyllis Applegarth
Christine Ambrose
James Antista
Clifford Lyle Marshall, Hoopa Valley Tribe
Howard McConnell, Yurok Tribe
Aaron Peters, Quartz Valley Reservation
Charla Combs
MPL Realty I Limited Partnership
Hoopa Tribal Forestry
James Horn
Scott River
Natural Resources Management Corporation
Karuk Tribe of California
Donald and Pamela Updegrave
Rick Svilich

Dixie Lee Fleeger
Joel Slaughter
Bill Myer
Rolf Skar, Siskiyou Regional Education Project
Meriwether Southern Oregon
Linda Duffy
Center for Biological Diversity
Benjamin Harlow
Josh Laughlin, Cascadia Wildlands Project
Roger Galbraith
Regina Chichizola, Klamath Forest Alliance
Lydia Garvey
Alison Laughlin
Frank Jones
Jay Lininger
Suzanne Savoie
Luke Ruediger
Connie Royer
Pamela Borich
Chandra LeGue, Oregon Natural Resources Council
Robert Schwartz
Jan Rice
Felice Pace
B. Sachau
Derek Volkart
Jim Bender
Eric Navickas
Pete Harrison
Benjamin Grunde
Dave Puritz
Bryan Olson
J. Michael Fay
Mark Johnson
Alan Panebaker
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Michael Meredith

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GLOSSARY OF TERMS

50th Percentile Fire Weather: Median fire weather conditions based on fuel moisture, temperature, relative humidity, and wind speed. Also called moderate conditions.

90th Percentile Fire Weather: The highest 10% of fire weather days. Fuel moisture, temperature, relative humidity, and wind speed are only exceeded 10% of the time based on historical weather observations. Also called severe conditions.

Active Crown Fire: A fire that moves into and through the tree crowns, generally due to a combination of fire intensity and ladder fuels

Activity Fuels: Fuels created by management actions.

Anadromous Fish: Species of fish that are born in freshwater, move to the ocean to mature, and return to freshwater to reproduce.

Annosus root disease (*Heterobasidion annosum*): A fungus that attacks a wide variety of woody plants. Infection may spread by spores that colonize freshly cut stumps or basal wounds, or via root contact.

Aquatic: Living or growing in water.

Aquatic Conservation Strategy (ACS): A strategy "developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands" (USDA Forest Service and USDI Bureau of Land Management 1994b, B-9).

Aquatic Conservation Strategy Objectives: Objectives that "define the context for the agency review and implementation of management activities. Complying with the Aquatic Conservation Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore conditions. The baseline from which to assess maintaining or restoring the condition is developed through a watershed analysis. Improvement relates to restoring biological and physical processes within their ranges of natural variability." (USDA Forest Service and USDI Bureau of Land Management 1994b, B-10).

Areas with Watershed Concerns (AWWC): Areas identified in the LRMP ROD (USDA Forest Service 1995c) because cumulative watershed effects are a special concern due to a combination of high disturbance levels (roads, timber harvest, fire), potential for landslides, potential for surface erosion, and poor aquatic habitat conditions. The LRMP ROD (ibid.) states that a "cautious approach will be taken in AWWC, with respect to future land management activities," and that "Watershed Analysis, as part of ecosystem analysis, will be required prior to implementing site-disturbing activities."

Background (relative to watershed): A watershed's natural sediment production and delivery, or sediment delivery, assuming no disturbance.

Beneficial Uses: "Beneficial uses" of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves (from Section 13050(f) of California's Porter-Cologne Water Quality Control Act).

Best Management Practices (BMPs): Measures certified by the State Water Quality Control Board and approved by the Environmental Protection Agency as effective means of reducing water quality impacts from non-point sources of pollution.

Board Foot: A unit of measurement equal to an unfinished board one-foot square by one-inch thick.

Burn Severity: Effects of fire on the soil surface. Related to fire intensity and duration.

Canopy: Tree crowns in a stand.

Canopy Base Height: The distance from the ground to the base of the tree crowns (usually an average value for a stand).

Capable Lands: Lands where at least 20 cubic feet of commercial wood products can be grown per acre per year.

Classified Road: Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned road, National Forest System roads, and other roads authorized by the Forest Service.

Coarse Woody Debris (CWD): Woody material at least 20-inches in diameter from whatever source that is dead and lying on the forest floor. Term used for terrestrial species habitat. See Large Woody Debris for aquatic species habitat.

Community Capacity: The collective ability of residents in a community to respond to external and internal stresses, to create and take advantage of opportunities, and to meet the needs of residents. Physical capital, human capital, and social capital are the primary components of community capacity.

Compacted Soils: Soils with reduced porosity.

Critical Habitat: Defined in the ESA as (1) the specific areas within the geographical area occupied by the species, at the time it is federally listed, on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed, when it is determined by the Secretary of the Interior that such areas are essential for the conservation of the species.

Crowning: Situation where fire rises to the tree tops and begins advancing from tree top to tree top, or where fire intermittently ignites tree crowns as a surface fire advances.

Cumulative Effects: Those effects resulting from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

Cumulative Watershed Effects Model: A model for Cumulative Watershed Effects with three components: Equivalent Roaded Acres (ERA), sediment delivery from surface erosion, and sediment delivery from mass wasting. The model quantifies disturbances and land sensitivity at the 7th field watershed scale and can calculate them at larger scales. The estimated results fall on a continuum. As disturbances increase over time and space, at some point the risk of initiating or contributing to existing adverse cumulative watershed impacts becomes a cause for concern. Concern thresholds have been identified for each component based on field observations in the Forest.

Cytospora* Canker (*Cytospora abietis): A fungus that infects softwood trees. It kills the cambium, girdling the limb and causing death of infected branches. A secondary infection to mistletoe.

Diameter Breast Height (DBH): The diameter of a standing tree at a point 4½ feet above ground level, measured from the uphill side.

Direct Attack: Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or physically separating the burning from unburned fuel.

Direct Effects: Those effects occurring at the same time and place as the initial cause or action.

Dispersal: The relatively permanent movement of individual animals from one location to another. Usually dispersal is the movement of young animals from where they were born to a site where they eventually settle to breed.

Dwarf Mistletoe (*Arceuthobium spp.):* A host specific parasitic seed plant found in all the major conifer species (red fir, white fire, Douglas-fir and incense cedar).

Ecosystem: A dynamic community of biological organisms, including humans, and the physical environment with which they interact.

Effects: Impacts; physical, biological, economic, and social results (or expected results) from implementing an activity.

Embeddedness: Degree to which large streambed materials such as cobbles and gravel are surrounded or covered by fine sediment.

Endangered Species: Any species that is in danger of extinction throughout all or a significant portion of its range.

Environmental Justice: Executive Order 12898 requires an assessment of whether minorities or low-income populations would be disproportionately affected by proposed actions.

Equivalent Road Acres (ERA): An index of average watershed disturbance expressed in road-equivalent acres relative to a "threshold of concern" assigned for the watershed.

Erosion: A general term for movement of soil particles on the surface of the land initiated by rainfall and running water. This includes surface erosion and channel erosion, as opposed to landsliding.

Filtering Capacity: Ability of a riparian reserve to trap sediment and prevent it from reaching a stream.

Fine Fuels: Fuels less than 3" in diameter that are easy to ignite.

Fir Engraver Beetle (*Scolytus ventralis*) – a burrowing beetle that attacks most true fir species in the western United States. Attacks can result in bark kill around the tree bole, top kill, and tree mortality.

Fire Behavior: The manner in which a fire reacts to fuels, weather, and topography.

Fire Intensity: A general term relating to the heat energy released in a fire.

Fire Regime: The combination of fire frequency, predictability, intensity, seasonality, and distinctive characteristics of fire in an ecosystem. Agee (1993) defines three broad categories of fire severity "based on the physical characters of fire and the fire adaptations of vegetation:"

- **Low Severity Fire Regime:** Effect of typical fire is benign. Fires are frequent (often < 20 years), of low intensity, and the ecosystems have dominant vegetation well-adapted to survive fire.
- **Mixed Severity Fire Regime:** Fires are of intermediate frequency (25-100 years), range from low to high intensity, and have vegetation with a wide range of adaptation.
- **High Severity Fire Regime:** Fires are usually infrequent (often >100 years) but may be of high intensity, most vegetation is at least top-killed.

Fire Return Interval: Number of years between two successive fire events in a given area.

Fire Risk: The statistical probability of a fire start occurring over a ten-year period for a given thousand-acre area.

Fire Severity: The degree to which a site has been altered or disrupted by fire; severity is affected by fire intensity and how long the fire remains at the site. In this document, fire severity is defined as tree mortality.

Fire Suppression: All work and activities associated with extinguishing a fire.

Force Account: Term to refer to Forest Service personnel and equipment

Forest Plan (LRMP): The Klamath National Forest Land and Resource Management Plan, approved in 1995. The Forest Plan provides land allocations, Standards and Guidelines, and direction for management of the Klamath National Forest.

Fuel Loading: The quantity of fuel per acre in a given area.

Fuel Treatment: The process of removing and/or modifying natural or human created fuels to reduce fire hazard and achieve other resource objectives.

Fuels: Anything within the forest that will burn; usually live and dead woody vegetation.

Full-Bench Skid Trails: For ground-based equipment skid trails, the entire road surface is cut into the hill slope.

Geographical Information System Coverage: Data layer in a Geographical Information System.

Grapple System: A mechanical method of piling fuels using an articulating arm on a low ground pressure vehicle that picks up the material and places it on the pile.

Green Tree Retention: A regeneration cut in an even-aged silvicultural system that maintains a portion of the existing stand, creating a two-storied structure with two or more age classes present.

Ground-based Equipment: This means equipment that runs on the ground, like tractors, rubber-tired skidders, and masticators.

Group Selection: A harvest treatment in an uneven-aged silvicultural system that removes small groups of trees, resulting in different age classes in the stand.

Hawksworth Rating System: A system developed by Hawksworth in 1977 to rate severity of infection by dwarf mistletoe in a tree or stand. The rating system forms a basis for defining management implications and recommendations.

Head of Fire: Advancing edge.

Healthy Stand (for the Project Area): Exhibits insect and disease levels such that mortality is not substantial (snag and coarse woody debris levels are within Forest standard and guidelines); little decadence (few dead or dying trees, relatively few large down logs or snags) although the area maintains some structural components of older stands; trees per acre (stocking level) within the range that can be supported by the land; and conditions such that wildfire would not burn more than 25% of the dominant vegetation at a high intensity.

Hydrologic: Dealing with the movement and properties of liquid water in environmental systems. Includes the circulation patterns of water in the biosphere from condensation and precipitation to movement both on and under the ground surface to evaporation back into the atmosphere.

Hydrologic Recovery: Harvested timber stand with sufficient canopy closure that snow accumulation, melt rates, and soil protection from raindrop impact are comparable to pre-harvest levels. This typically is achieved when the average tree size is 8” diameter breast height or 35 feet tall. Recovery is complete by around 30 years after harvest on the westside of the Forest.

Impacts: Physical, biological, economic, and social results (or expected results) from implementing an activity.

Incorporation by Reference: A technique used to cut down on the bulk in environmental documents without impeding agency and public review of the action. The material included as part of the document must be cited in the document and its content briefly described.

Indirect Effects: Those effects occurring later in time or that are spatially removed from the activity.

Inference Point: The midpoint of a zone where disturbances become great enough to cause concern about initiating or contributing to adverse cumulative watershed effects.

Infiltration (soil): The movement of water through the soil surface into the soil.

Interdisciplinary: The utilization of individuals representing two or more areas of knowledge and skills focusing on the same subject.

Irretrievable: An irretrievable commitment of resources entails a loss of production, harvest, or use of natural resources. Such decisions are reversible, but the production opportunities foregone are irretrievable (50 Federal Register 26082).

Irreversible: An irreversible commitment of resources entails a loss of future options. This applies primarily to the effects of use of non-renewable resources such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over a long period of time (50 Federal Register 26082).

Issue: Point of discussion, debate, or dispute about the environmental effects of the proposed action.

Ladder Fuels: Small trees and brush in the understory that allow fire to move from the ground into the tree crowns

Land Allocation: The assignment in the LRMP of a management emphasis to particular land areas with the purpose of achieving goals and objectives.

Late-successional characteristics: Characteristics of a stand of trees indicative of maturity, including mature and overmature trees in the overstory; multi-layered canopy with trees of several age classes; and standing dead trees and down material.

Late-successional habitat: Older forested stands with moderate to high canopy closure; often containing a multilayered, multispecies canopy dominated by large overstory trees; large trees with broken tops or other indications of old and decaying wood; numerous large snags; and moderate to heavy accumulations of large logs on the ground.

Late-successional stands: Late-successional stands within the Project Area are defined as stands with an average DBH > 24". On the north and east facing slopes, theses stands contain a mix of conifer species and generally exhibit complex structure and abundant DWD. Late-successional stands on south and west facing slope, are typically more open and pine dominated with less DWD. True fir late-successional stands are generally single storied with little understory.

Late-successional reserves (LSR): Large blocks of habitat that are distributed across the range of the northern spotted owl and spaced closely enough to facilitate dispersal of owls. Late-successional reserves are managed to provide habitat for late successional and "old growth" species.

Management Area (MA): A distinct geographical area with specified objectives and prescriptions.

Management Direction: A statement of multiple use and other goals and objectives, along with the associated management prescriptions and Standards and Guidelines to direct resource management.

Mass Wasting: Movement of soil material in landslides and debris torrents.

Masticator: Equipment that grinds or chews up vegetative material.

Matrix: Lands outside of reserves and withdrawn areas; lands assigned a regulated timber yield.

Monitoring: Process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Montane: Pertaining to mountain conditions.

National Environmental Policy Act (NEPA): The act that governs how federal agencies assess impacts of management actions on public lands. The process is interdisciplinary and requires consideration of the environmental effects of alternatives and disclosure of those effects.

National Forest System Road: A classified Forest road under the jurisdiction of the Forest Service. The term "National Forest System Roads" is synonymous with the term "forest development roads" as used in 23 U.S.C. 205.

Noxious Weed: Any plant so designated by the Weed Control Regulations and identified on a regional district noxious weed control list. They are generally non-native and resistant to control efforts.

Overstory: The portion of trees in a forest which forms the uppermost layer of foliage.

Passive Crown Fire: A fire that remains on the ground surface but exhibits some individual tree or group torching. Fire intensity is still fairly low.

Peak Flow: The greatest stream or river flow occurring in a year from a single storm event.

Rain-on-Snow Event: Rain falling on a snowpack and rapidly melting the snow, causing the melt water to be added to the rain, creating flood conditions.

Record of Decision: A document separate from but associated with an environmental impact statement that states the management decision and provides the rationale for that decision.

Reforestation: The natural or artificial restocking of an area with trees.

Residence time: The amount of time required for a fire front to pass a stationary point. Longer residence times result in greater resource impacts.

Residual: The trees remaining after harvesting; also known as the crop trees.

Resilience: An ecosystem's ability to maintain structure and patterns of behavior in the face of disturbance.

Rill: Very small streams occurring during or directly after precipitation, especially on bare soil, often creating a temporary gully and causing rill erosion.

Riparian: In general, characterized by being situated on the bank of a river or other body of water. In ecology, the term is applied both to species that live near streams and to the area adjacent to streams where vegetation and microclimate are influenced by the presence of the stream.

Riparian Reserves (Riparian Reserves): A land allocation in the LRMP that includes an aquatic ecosystem and the adjacent upland areas directly affecting it. It also includes unstable and potentially unstable lands that are not associated with aquatic areas. Specific Standards and Guidelines provide direction for these areas as outlined in Management Area 10 of the LRMP.

Risk: The chance of loss.

Risk Ratio (for cumulative watershed effects model): The amount of the disturbance in the watershed relative to the hydrologic or sediment inference point.

Road: A motor vehicle travelway over 50" wide, unless classified and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

- **Classified Roads:** Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).
- **Temporary Roads:** Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).
- **Unclassified Roads:** Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1). The regulations at 36 CFR 223.37 require revegetation within 10 years.

Road Cut: Soil or rock material removed during road construction, usually from the upslope side of the road.

Road Decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road Fill: Soil or rock material placed on the ground as part of the road surface.

Road Maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

Riparian Reserves: See **Riparian Reserves**

Salvage: Removal of recently-dead, dying, or deteriorating trees to minimize the loss of wood products.

Sanitation: The removal of damaged or susceptible trees, essentially to prevent the spread of insects or disease; an improvement cut.

Scoping: The process used to identify the scope of issues to be addressed and to determine the significant issues related to a proposed action.

Sediment: Soil particles in water. Suspended sediment consists of small soil particles carried along by the water's turbulent flow.

Silviculture: The art and science of growing and tending forest vegetation. It includes controlling the establishment, composition, and growth of forests for specific management goals.

Silviculture Prescription: A site-specific operational plan that describes the forest management objectives for an area. It prescribes the method for harvesting the existing forest stand, and a series of silviculture treatments that will be carried out to establish a free growing stand in a manner that accommodates other resource values as identified.

Site Potential Tree Height: The average maximum height of the tallest dominant trees (200 years or older) for a given site class.

Skyline Yarding System: Moving logs from the stump to the landing either partially or fully suspended by a cable.

Soil Porosity: State of having pores or holes in the soil that hold air or water; permeability.

Stand: A community of trees or other vegetation uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities.

Stand Density Index (SDI): A relative measure of the amount of stocking on a forest area. Often described in terms of stems per acre.

Standard and Guideline: A principle requiring a specific level of attainment, a rule to measure against.

Snag: A standing dead tree.

Social Analysis: Analysis that uses social science information to determine how proposed actions would affect humans.

Soil Productivity: The capability of a soil to produce a specific crop such as fiber, forage, etc., under defined levels of management.

Stocking: The degree to which trees occupy the land, measured by BA and/or number of trees by size and spacing, compared with a stocking standard; that is, the BA and/or number of trees required

to fully utilize the land's growth potential. Where tree growth is inhibited due to competition from too many trees, the site is said to be **overstocked**.

Stocking Control: See thinning.

Suppression Forces: Resources used to fight a fire, consisting of firefighters with hand tools at a minimum. May also include fire engines and bulldozers, helicopters and tanker planes.

Suppressed Trees: Smaller trees in the lower canopy layer.

Surface Fire: Fire that remains on the forest floor because the combination of fire intensity and ladder fuels is not sufficient to move it into the tree crowns. Only surface fuels and small vegetation are burned.

Surface Fuels: Loose combustible material on the soil surface, consisting of fallen leaves, twigs, bark, and small branches, as well as grasses, small plants, seedlings trees, dead branches, and logs.

Thinning: Removing trees from a stand to redistribute the growth potential or to benefit the quality of the residual stand.

Threatened Species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Torching: Ignition and subsequent flare-up of a fire, usually burning from the bottom to the top of a tree or small group of trees.

Tree Crown: Leafy portion.

Turbidity: Deposition of substrate material suspended in water.

Unclassified Road: Roads on National Forest System lands that are not managed as part of the Forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorizations and were not decommissioned upon the termination of the authorization.

Understory: Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Variable Density Thinning: A thinning treatment that results in an irregularly distributed and unevenly stocked stand. Conditions range from widely spaced (40’–60’) trees (those being cultured for large tree attributes) to no-thin areas with dense thickets of trees. Between these extremes, the remaining stand is thinned with variations according to tree species, crown position, tree attributes, slope position, aspect and elevation.

Vertical Fuels: Standing vegetation, either live or dead.

Watershed: The entire land area that drains to a specific point.

- **5th field watershed:** A watershed that ranges from about 40,000 to 250,000 acres in size.

- **6th field watershed:** A watershed that ranges from about 10,000 to 40,000 acres in size.
- **7th field watershed:** A watershed or drainage that ranges from about 2,500 to 10,000 acres in size.

Water Repellency (for soils): Loss of soil porosity, preventing water from infiltrating and causing water to run off.

Watershed Analysis: Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives.

Wet Weather Operations Standards: Specific information used to help determine when activities are at risk of not meeting BMPs. The guidelines are used to determine if conditions are favorable for wet weather or winter operations, and to provide guidance as to when conditions warrant suspension of operations, when operations may begin or resume, or when and what remedies may be appropriate.

Appendix A Maps

Appendix B Cumulative Effects Summary

Table B-1 List of Past, Present and Reasonably Foreseeable Future Actions in the Analysis or Action Area

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
T41S R1E Sect. 4		Headwaters Cottonwood	Fleeger	Telephone call 06/07/2006	None Planned		N/A	
Sterling THP, T48N R8W Sect. 19	Sterling THP	Deer Beaver	Timber Products	Timber Harvest Plan, CDF	Timber Harvest	2005	Sterling THP: 64 acres of clear cut in 3 units; ground based systems.	Finished in 2005. No additional harvest planned at this time
T47N R8W Sec 5 and 7; T48N R8W Sec 19; T48N R9W Sec 23 and 25. MDM	North Klamath THP	Bear, Deer and Beaver Creeks	Michigan-California Lumber Company	Timber Harvest Plan, CDF	Timber Harvest	2008-09	178 acres clear cut, 60 ac commercial thin, 15 ac shelterwood, 70 ac shelter/sani/salv, 3 ac road ROW.	New THP as of 10/25/07
T41S R1E Sect. 18		Grouse	Caswell	Meeting with Jim Davis and Moki Holmes; THP/ODF	Timber Harvest	2004-05	2005: 136 acres of partial cut; ground based; 150 MBF	Will continue with sustained small scale timber harvest.
T41S R1E Sect. 8		Grouse, Hungry, Headwaters Cottonwood	Caswell	Meeting with Jim Davis and Moki Holmes; THP/ODF	Timber Harvest	2004-05	2005: 520 acres of partial cut; ground based. 80 MBF	Will continue with sustained small scale timber harvest.

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
T41S R1W Sect. 13		Grouse Creek	Caswell	Meeting with Jim Davis and Moki Holmes; THP/ODF	Timber Harvest	2004-05	2005: 24 acres of partial cut; ground based Section 13.	Will continue with sustained small scale timber harvest.
T41S R1E Sect. 18	Roadside Hazard	Grouse	Caswell	Meeting with Jim Davis and Moki Holmes; THP/ODF	Roadside hazard tree removal	2006-07	Individual trees identified as hazards along 41S13 road.	
T40S R1W Sect. 26		Long John/ Applegate	Meredith	ODF THP	Timber Harvest	2003, 2004	2003: NW1/4; 90 acre partial cut; ground based; 2004 road construction NW 1/4.	2003 logging and 2004 road construction are both in north 1/2 of section on Applegate side of ridge.
T40S R1E Sect.28		Headwaters Cottonwood	Meriwhether Southern Oregon	ODF THP	Timber Harvest	2006	4 clear cut units totalling 102 acres, cable yarding, east 1/2 of section, 1118 MBF, 3,400 feet of road construction in 2002.	
T41S R1E Sect.17		Hungry Creek	Kunkle	Jim Davis road use permit files.	Timber Harvest	2005	Roughly 60mbf of thin, sanitation, salvage	Old patented mining claim. Finished in 2005. Minor

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
								logging.
T48N R8W Sect. 24		Hungry Creek	Fruit Growers	CDF Telephone call w/Denise 06/07/06	None planned	Future		
Hungry Parrot THP, T48N R8W Sect. 25	Hungry Parrot THP	Hungry Creek	Fruit Growers	CDF THP	Timber Harvest	Finished 1/2006	10 acres ground based: clear cut and alternative harvest	
Hungry Parrot THP, T48N R8W Sect. 36	Hungry Parrot THP	Hungry Creek	Fruit Growers	CDF THP	Timber Harvest	Finished 1/2006	315 acres ground based: clear cut and alternative harvest	
Hungry Parrot THP, T48N R7W Sect. 30	Hungry Parrot THP	Hungry Creek	Fruit Growers	CDF THP	Timber Harvest	Finished 1/2006	31 acres ground based: clear cut and alternative	
Hungry Parrot THP, T48N R7W Sect. 31	Hungry Parrot THP	West Fork Cottonwood	Fruit Growers	CDF THP	Timber Harvest	Finished 1/2006	137 acres ground based: 21 acres clear cut and alternative harvest	
T48N R7W Sect. 17, 18, 19, 20		Headwaters Cottonwood	Fruit Growers	CDF, telephone call with Denise 06/12	None Planned	Future	N/A	

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
T40S R1E Sect. 28 NW 1/4		Grouse	Slaughter	Telephone call 06/07/2006	None Planned	Future	N/A	
T41S R1E Sect. 3and4		Headwaters Cottonwood	Oregon State	Called ODF 6/12/06; nothing planned	None Planned	Future	N/A	
T41S R1W Sect. 7		Upper Cow	Jennings	Beaver WA, ODF	Grazing	On-going	Entire ownership and adjacent USFS	
T40S R1E Sect. 28, 30 and 32; T41S R1E Sect. 10		Grouse and Headwaters Cottonwood	BLM - Oregon	Telephone call to Ed Riley 06/12/06	None Planned	Future	Per Ed no timber harvest or fuels projects planned	Ed Riley 541-618-2497
Fruit Growers land southeast of the project area	Bull-Schneider, Arrastra, Paul's Gulch THPs	Hungry and Headwaters Cottonwood	Fruit Growers	CDF THP	Past harvest on FGSC	Past	Bull-Schneider THP (2000), Arrastra THP (1992), Paul's Gulch THP (1992)	These past actions have been accounted for in the baseline
T48N R8W Sect. 25, 35, and 36; T47N R8W Sect.1and2	Nickel	Hungry	Fruit Growers	Dustin Lindler Jefferson Resource Co.	Timber Harvest	2007	Roughly 600 acres affected; treatments include selective thinning and dispersed clear cuts using tractor and cable logging. Some temp road construction.	Per Dustin they are in the planning phase, they expect a THP by mid February 2007.

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
T48N R8W Sect. 33; T47N R8W Sect.3	Bumblebee	Hungry	Fruit Growers	Dustin Lindler Jefferson Resource Co.	Timber Harvest	2007	Roughly 500 acres affected; treatments include shelterwood removal and dispersed clear cuts using tractor and cable logging. Some temp road construction.	Per Dustin they are in the planning phase, they expect a THP by mid February 2007.
T48N, R8W, Sections 13, 24, 25, and 30	Hungry Youth	Hungry	Fruit Growers	Doug Staley, FGSC	Timber Harvest	2009	Roughly 1000 acres affected; treatments may include dispersed clear cuts (25%) and selection/commercial thinning (75%).	Unknown when THP will be final. Unit location and logging method not known at this time.
T40S R1E Sect. 28		Headwaters Cottonwood, Grouse	Gary Wirth	Telephone call 06/13/06	None Planned	Future		
T48N R8W Sect. 19		Deer Beaver	Timber Products	Timber Harvest Plan, CDF	Past harvest	Past	2000: 166 acres; 2003: 635 acres	These past actions have been accounted for in the baseline
Project Area	Grazing: East Beaver Allotment	Grouse, Long John, Upper Cow	USFS	Range	Grazing	On-going	67,000 acres within the Allotment including roughly 8000 in Project	East Beaver Allotment; 200 cow/calf pairs; season

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
							Area.	6/16-10/31
Project Area		all	USFS	Recreation	Recreational Uses	On-going	Hiking, biking, camping, hunting, hunting camps throughout area	
Tennis Thin, T41S R1E Sect. 9 and 16	Tennis Thin	Headwaters Cottonwood	USFS	Bill Bailey	Timber Harvest	2006-07	175 acres commercial harvest, tractor and skyline yarding	
Colestine Project T40S R1E Sec. 26, 34 and 35; T41S R1E Sec. 2	Colestine	Headwaters Cottonwood	USFS	Carl Varak	Timber Harvest	2006	425 acres thinning in pine plantation	
~~T41N R1E Sec. 5 and 8~~	~~Vista Thin III~~	~~Grouse~~	~~USFS~~	~~Carl Varak~~	~~Plantation Thinning~~	~~2006-07~~	~~Approximately 80 acres of older plantation thinning~~	Action dropped from program of work per Bailey and Blessing. 12/6/06
T40S R1E sect. 15, 16, 17, 20, 21, and 22, W.M., Oregon.	Mt. Ashland Ski Area Expansion	Ashland, Headwaters Cottonwood, Grouse	USFS: Rogue River NF	USFS: Rogue River NF	Ski Area Expansion	2006+	Approximately 80 acres affected; ski lift, ski terrain, facilities improvements, expanded parking,	

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
							tubing area; see description in ROD	
T39S, R1E sect. 17, 19, 20, 21, 25, 27, 28, 29, 30, 31, 32, 33, 34 and 35; T40S R1E sect. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 17; T39S R1W sect. 24, 25, 26, 34, 35 and 36; and T40S R1W sect. 1 and 2, Williamette Meridian, Oregon.	Ashland Forest Resiliency Project	Ashland watershed	USFS: Rogue River NF	USFS: Rogue River NF	Thinning, fuels treatments, DFPZs	2006+, ROD not signed.	8, 150 acres; see description in DEIS	

Location:	Project Name:	Watershed:	Land owner:	Contact Information:	Activity:	Year(s):	Acres/area Affected:	Notes:
T. 39 S., R. 1 E., in sections 17, 19, 20, 21, 27, 28, 29, 32, 33, and 34; T. 40 S., R. 1 E., in sections 4 and 5; W.M., Jackson County, Oregon.	Ashland Watershed Protection Project	Ashland Creek Watershed, and partially within the Tolman and Hamilton Creek Watersheds	Rogue-Siskiyou National Forest	Linda Duffy, District Ranger	Fire hazard reduction: fuels treatments, harvest, burning	ROD 2001	1549 acres treated; 445-504 acres of LS habitat affected.	
Plantations on Forest Service land	Plantation Thinning		USFS	Carl Varak	Pre-commercial thinning	On-going	Pre-commercial thinning in existing plantations	

Table B-3 Historic Logging

Location	Project Name	Watershed	Land owner	Contact Information	Activity[2]	Year(s)	Acres/ area Affected
AAB[1]	Unknown	Grouse	USFS	Carl Varak	Timber harvest – CC	1960–1970[3]	20
AAB	Unknown	Upper Cow	USFS	Carl Varak	Timber harvest - CC	1960–1970[3]	40
AAB	Unknown	Long John	USFS	Carl Varak	Timber harvest - CC	1960–1970[3]	386
AAB	Doe Peak	Grouse	USFS	Carl Varak	Timber harvest - Klamath Partial Retention (KPR)	1970–1980	92
AAB	Grouse Creek	Grouse	USFS	Carl Varak	Timber harvest - KPR	1970–1980	39
AAB	Grouse Creek	Grouse	USFS	Carl Varak	Timber harvest - CC	1970–1980	20
AAB	Stateline	Upper Cow	USFS	Carl Varak	Timber harvest - KPR	1970–1980	415
AAB	Wymer (?) Glade	Upper Cow	USFS	Carl Varak	Timber harvest - CC	1970–1980	30
AAB	Doe Peak	Long John	USFS	Carl Varak	Timber harvest - KPR	1970–1980	276
AAB	West Branch	Long John	USFS	Carl Varak	Timber harvest - KPR	1970–1980	1040
AAB	Grouse Creek	Long John	USFS	Carl Varak	Timber harvest - KPR	1970–1980	210
AAB	Pine Marten #1	Grouse	USFS	Carl Varak	Timber harvest - CC	1980–1990	20
AAB	Pine Marten #2	Grouse	USFS	Carl Varak	Timber harvest - CC	1980–1990	23
AAB	Ruffy	Grouse	USFS	Carl Varak	Timber harvest - CC	1980–1990	113
AAB	Meridian	Grouse	USFS	Carl Varak	Timber harvest - CC	1980–1990	13
AAB	Pajama	Long John	USFS	Carl Varak	Timber harvest - CC	1980–1990	66
AAB	Pine Marten #1	Long John	USFS	Carl Varak	Timber harvest - CC	1980–1990	113
AAB	Pine Marten #2	Long John	USFS	Carl Varak	Timber harvest - CC	1980–1990	87
AAB	Lon Jon I	Long John	USFS	Carl Varak	Timber harvest - CC	1991	143

[1]AAB=Analysis Area Boundary- includes FS land w/in LSR in Grouse, Upper Cow, Long John and Deer/Beaver subwatersheds

[2]CC-clear cut, KPR=Klamath partial retention

[3] 1960–1970 or earlier/unknown

Appendix C Management Opportunities Related to the Project

THE MT. ASHLAND LATE-SUCCESSIONAL RESERVE ASSESSMENT

The *Mt. Ashland Late-Successional Reserve Assessment* (USDA Forest Service 1996a) presents approximately 41 management opportunities (Recommendations) for improving conditions in the LSR (USDA Forest Service 1996a, 51–76). The Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project action alternatives address thirteen of these management opportunities, provided here using the numbering system from the LSR Assessment (ibid.).

MT. ASHLAND LSR RECOMMENDATIONS

Implementing Strategies 2, 3 and 4 out of 5 as follows:

Strategy 2: Protection (Fire Management)

South Zone

Vegetation Management 3 of 3

1) Vegetation management activities to reduce stand densities and fuel ladders; includes timber harvest, pre-commercial thinning, underburning, and manual treatment of live and dead vegetation.
    a. DFPZs – implementing 5 of the 10 proposed DFPZs in the South Zone
    b. General area underburning – implementing 120 acres of general underburning outside of thinning units.
    c. Mechanical treatments (thinning) – implemented on 3,875 acres
    d. Target early-successional stands (plantations and natural stands) – pre-commercial thinning on 711 acres.
2) Coarse woody material managed (maintained) where fire hazard reduction is the main objective.
3) Consider fuels treatment needs during the planning and implementation of all vegetation management activities.

<u>Strategy 3</u>: Late-successional habitat enhancement, 4 of 5

1) Follow recommendations for South Zone fire Management (see above).
2) Manage stand densities to promote tree growth and vigor – implemented on 2,589 (trees >9") acres.
3) Follow recommendations in Appendix E for species tree composition and structure – implemented with prescriptions
4) Strive to move mid-successional stands toward desired levels and sizes of CWM and snags - accomplished over the long-term by growing trees to desired tree size class. For the short term maintain CWM in largest size classes available.

<u>Strategy 4</u>: Restoration

3) Focus on pre-commercial thinning
4) Consider fuels treatments during planning and implementation

THE BEAVER CREEK ECOSYSTEM ANALYSIS

The Beaver Creek Ecosystem Analysis (USDA Forest Service 1996b) presents 68 management opportunities (Recommendations) for improving conditions in the watershed (ibid., pp. 6-1–6-9). Many of the recommendations are repetitive; some contain numerous concepts. The Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project action alternatives address twenty-four of these management opportunities, provided here using the numbering system from Chapter 6 of the Ecosystem Analysis (ibid.).

2a – Evaluate and rehabilitate or eliminate stream accesses to minimize impacts.

2d – Decommission roads in Riparian Reserves where appropriate.

3a – Reduce open road densities in critical wildlife areas to levels that minimize effects on wildlife. Accomplish this through seasonal and permanent closures.

4 – Roads are maintained in a condition adequate for fire suppression access. Roads scheduled for decommissioning are decommissioned after fuels treatments.

5a – Verify Forest Transportation Inventory data base and inventory all non-system roads.

5b – Develop a transportation management plan that identifies needed access routes, seasonal and permanent road closures, and decommissioning possibilities.

6 – Identify primary access routes to private lands. Work cooperatively with private landowners to explore road improvements and closure opportunities.

7a – Manage public lands to maintain connectivity.

8 – Reduce densities of smaller sized trees and reduce high fuels loadings that are impacting the health and ability of the larger trees to survive disturbances. Utilize thinning from below and underburning to enhance goshawk habitat and provide wood products to the local community.

11 – Implement commercial thinning or fuelwood removal to accomplish wildlife habitat quality improvements. Prioritize opportunities by wildlife habitat needs.

12a – Determine areas with high fuel loadings and treat them.

12b – Combine funding with wildlife and other habitat improvement projects to accomplish desired conditions.

12c – Identify strategic areas to break up fuels continuity.

12d – Use recommendations identifies in the Mt. Ashland LSR Assessment.

13 – Pursue cooperative fuels management pilot projects. Develop collaborative fuel management strategies to effectively utilize fire as a natural ecological process.

14 – Identify areas that need protection from fire and prescribe treatments in areas that would benefit by the reintroduction of fire; focus on upslope Riparian Reserves.

15 – Employ recommendations outlined in the Mt. Ashland LSR Assessment for fire management, which includes development of DFPZs and treatment rotations of 20-25 years for most of the remaining LSR area.

16b – Have an aggressive fuels management program to reduce fuel loading.

20a – Identify high density stands, especially on south and west aspects; the stands are highest priority for commercial and pre-commercial thinning opportunities.

21 – Identify historic pine sites and selectively remove Douglas-fir and white fir.

21c – Protect existing sugar pine by treating the fuels around them.

29 – Maintain and improve communications with private landowners and managers.

31b – Utilize Riparian Reserves to provide connectivity as dispersal corridors between the Mt. Ashland LSR and neighboring LSRs.

35a – Manage current AWWCs to improve watershed health.

Appendix D Best Management Practices

Best Management Practices (BMPs) were developed to comply with Section 208 of the Clean Water Act (USDA Forest Service 2000). BMPs have been certified by the State Water Quality Resources Control Board and approved by the Environmental Protection Agency (EPA) as the most effective way of protecting water quality from impacts stemming from non-point sources of pollution. These practices have been applied to forest activities and have been found to be effective in protecting water quality within the Klamath National Forest. Specifically, effective application of the R-5 USFS BMPs has been found to maintain water quality that is in conformance with the Water Quality Objectives in the North Coast Regional Water Quality Control Board's (WQCB) Basin Plan (WQCB 2007).

Region 5 Forest Service BMPs have been monitored and modified since their original implementation in 1979 to make them more effective. Numerous on-site evaluations by the WQCB have found the practices to be effective in maintaining water quality and protecting beneficial uses. Calendar year 2007 was the sixteenth year of the Best Management Practices Evaluation Program (BMPEP) on the Klamath National Forest and the Forest Service Pacific Southwest Region (Region). This program is designed to evaluate how well the Forest and the Region implement BMPs and how effectively the BMPs control water pollution from National Forest lands. Onsite evaluations have been divided into 28 evaluation categories that reflect related timber, roads, mining, recreation, vegetation management, fire, watershed and range practices.

The Forest monitors the implementation and effectiveness of BMPs on randomly selected projects each year. BMP effectiveness requirements were met on 90-100% of the sites sampled in 2000-2007. The average BMP effectiveness was 97%. Results of this monitoring can be found on the Klamath National Forest Web page, or is available in the project file (USDA Forest Service 2007).

In 2007, BMPs were fully implemented at 100% of the sites evaluated and effective at 98% of the sites evaluated. This represents a slight change in BMP implementation (a 7% increase) and effectiveness (a 2% decrease) compared to 2006.

The following list of BMPs will be implemented in the Project. A description of the objective of each BMP is included, as well as how each practice will be specifically implemented within the Project. For additional information on the BMPs and their objectives, see Water Quality Management for Forest System Lands in California (USDA Forest Service 2000).

BMP 1.1 – Timber Sale Planning Process: The objective is to incorporate water quality and hydrologic considerations into the Timber Sale Planning Process.

The Interdisciplinary Team included the following methods to reduce water quality impacts:

- For determining Riparian Reserve (RR) buffer widths, one site potential tree height was designated as 170' for the Project.
- Stream shading will not be reduced below 80% in order to maintain water temperature.
- Masticating equipment may operate on slopes up to 35%.
- Tractor yarding equipment is generally limited to slopes < 35%.
- Existing skid trails will be reused whenever possible.
- Existing landings will be reused whenever possible.
- Tractor skidding will occur on designated skid trails. End lining will be employed on slopes greater than 35% (see also BMP 5.2).
- The temporary roads will be outsloped and blocked after the harvest season (prior to the first winter after use).
- The temporary roads will be decommissioned (hydrologically restored) at project completion.
- Water drafting sites are existing sites and rocking of approaches will be used as required; all boards and plastic will be removed after use.
- Watershed personnel reviewed all proposed landings and new roads in the field to determine if unstable areas or other watershed issues were present and documented findings in project reports.
- Unstable areas will be reviewed by an earth scientist prior to actual landing construction and mitigated or avoided.
- Swing Boom Yarding (SBY) will be required within the timber sale contract to help alleviate the need to enlarge existing landings or construct additional landings.

BMP 1.2 – Timber Harvest Unit Design: The objective is to ensure that timber harvest unit design will secure favorable conditions of water quality and quantity while maintaining desirable stream channel characteristics and watershed conditions. The design should consider the size and distribution of natural structures (snag and down logs) as a means of preventing erosion and sedimentation.

The Interdisciplinary Team reviewed all units to select the appropriate vegetation and fuel treatment methods for the specific conditions within each unit.

- The IDT reviewed all units to select harvest methods appropriate to site conditions.
- Helicopter logging was selected as the most appropriate method to minimize soil disturbance in selected units.
- Tractor yarding equipment is generally limited to slopes ≤ 35%. This is incorporated into the unit layout.

- Equipment will be kept approximately 50 feet from the break in slope to the wetted channel or inner gorge of intermittent streams channels.

BMP 1.3 – Use of Erosion Hazard Rating for Unit Design: The objective is to identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.

- Based on field review and site data (% slope distribution, soil texture), the Forest Soil Scientist determined the surface erosion hazard rating for each treatment unit and prescribed logging systems and soil cover needs based on the erosion hazard rating.

- Some unit boundaries were defined by equipment slope limitations for skidders at 35%.

BMP 1.4 – Use of Sale Area Maps for Designating Water Quality Protection: The objective is to ensure recognition and protection of areas related to water quality protection delineated on a Sale Area Map or Project Map.

- All protected stream courses will be illustrated on the Sale Area Map.

- Helicopter landings will be designated on the Sale Area Map.

- Water drafting will be from existing drafting sites and will be identified on the Sale Area Map.

- Units that use tractor yarding will be designated on the Sale Area Map.

BMP 1.5 – Limiting Operating Period of Timber Sale: The objective is to ensure that the purchasers conduct their operations, including, erosion control work, road maintenance, and so forth, in a timely manner, within the time specific in the Timber Sale Contract.
The Project is proposed to take place during the normal operating season (NOS) that is defined as April 15 to October 15 and in dry periods outside the NOS with Line Officer approval. Activities will be restricted during periods of wet weather during the NOS.

- When stormy weather is predicted, the TSA will be on site to insure that winterization or erosion control procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.

- Forecast periods will be of a suitable length to allow completion or winterization of the task undertaken before precipitation events occur.

- The WWO Guidelines will be used to guide operations, especially haul, during periods of wet weather. The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. The project earth scientist may be called on to make recommendations to the TSA who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

BMP 1.6 – Protection of Unstable Lands: The objective is to provide special treatment of unstable areas to avoid triggering mass slope failure with resultant erosion and sedimentation.

- Project watershed personnel conducted field reviews of all proposed harvest units, identified unstable areas observed in the field, reviewed the marking prescription, and documented findings in project reports.

- Unstable lands will be identified on the Unit Information Cards, and equipment will be excluded from them.

- Project watershed personnel will be available for consultation during project implementation when activities occur in or adjacent to unstable areas.

BMP 1.8 – Streamside Management Zone (SMZ) Designation: The objective is to designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.

This is accomplished during the planning and layout phase of the project.

- Riparian Reserves within the project area have been designated; the IDT identified one site- potential tree height as 170'.

- Existing landings within 50 feet of the slope break to a stream channel or inner gorge will not be used.

- Sites for water drafting for dust abatement will be designated by the Forest Service and agreed to by the purchaser. Water drafting will meet the NOAA 2001 design standards when drafting from anadromous fish bearing stream reaches.

- There will be no yarding of trees or logs, through, in, or across stream channels.

- For all units where thinning is prescribed in RRs associated with intermittent stream channels, equipment will not operate within 50 feet of the break in slope to the wetted channel or inner gorge of intermittent streams.

- Where a clear break in slope is not evident, equipment will not operate within 50 feet of the wetted channel of any intermittent stream.

BMP 1.9 – Determining Tractor Loggable Ground: The objective is to minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.

- The Forest soil scientist field reviewed the tractor log units to verify that they were reasonable to tractor log from a soil resource perspective based upon the combination of % slope distribution, soil properties and erosion hazard rating.

- Project design features, such as restricting skidding equipment to slopes generally <35% and using endlining on slopes >35% will minimize disturbance to the steeper slopes in tractor units.

BMP 1.10 – Tractor Skidding Design: The objective is designing skidding patterns to best fit the terrain, the volume, velocity, concentration, and direction of runoff water can be controlled in a manner that will minimize erosion and sedimentation.
This is accomplished during the sale layout and operations phase of the project.

- Existing skid trails will be reused whenever possible.
- Skidding occurs generally on slopes less than 35%. If sections of skid trails have slopes exceeding 35%, slash or certified straw will be placed on them as determined necessary by the TSA.
- The location of operating slopes for ground based harvest systems will have a Forest Service representative design and approve areas for logging equipment to work and an earth scientist will provide recommendations if needed.
- Skid trails that intersect Forest Roads will be obliterated at the intersection.
- The location of new skid trails within RRs associated intermittent streams will be by agreement between the Timber Sale Contractor and the TSA. Perennial streams will not be crossed by skid trails. Intermittent channels may be crossed when dry and at locations designated by the Forest Service.
- Limit equipment disturbance within 20 feet on either side of swales, minimize equipment crossings, and avoid running trails up the axis of swales.

BMP 1.11 – Suspended Log Yarding in Timber Harvesting: The objective is to protect the soil mantle from excessive disturbance; to maintain the integrity of the SMZ and other sensitive watershed areas; and to control erosion on cable corridors.

- All skyline yarding units will require one end suspension. Full suspension will be required for any yarding across or over streams.
- Ground-based skidding will require front-end suspension of logs on skid trails.

BMP 1.12 – Log Landing Location: The objective is to locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality

- New and old landings would be selected for use that involves the least amount of excavation, and the least erosion potential.
- Landing design standards:
  a. Existing landings will be used to the extent possible.
  b. Do not use existing landings within 50 feet of the slope break to a stream channel or inner gorge.

BMP 1.13 – Erosion Prevention and Control Measures During Timber Sale Operations: The objective is to ensure that the purchaser's operations will be conducted reasonably to minimize erosion. This is accomplished during the pre-operations meeting with the purchaser, and throughout the operations phase of the timber sale.

- Erosion control measures are discussed during the pre-operations meeting with the purchaser and the Forest Service. They are updated throughout the operations phase of the timber sale.
- During project implementation, final locations and design characteristics for landings and new roads will be reviewed by watershed personnel prior to construction as needed.
- The project earth scientist will make periodic inspections of the sale to insure that the erosion control measures are having the desired effect and are in compliance with BMPs. The earth scientist will make recommendations to the FSR as to any action needed to comply with BMPs.
- The Klamath WWO (USDA Forest Service 2002) will be used.
- Storms may temporarily suspend operations to insure BMP compliance and to avoid adverse impacts to T & E species or species of concern (R5 sensitive).
- When stormy weather is predicted, the TSA will be on site to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.
- Also see BMP 1.5 and 1.11

BMP 1.16 – Log Landing Erosion Prevention and Control: The objective is to reduce impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures. This is best done by design of landing drainage measures during the planning phase of the project, and implemented during the operations phase.

- Proposed landings were identified on the Project planning map and were evaluated by earth scientists.
- Landings are shaped to disperse drainage and direct runoff away from watercourses at the time of construction. Rock armoring and silt fences with straw bales may be used as necessary to direct water to areas of suitable drainage and to capture sediment.
- The Project will utilize existing landings whenever possible. Swing Boom Yarding (SBY) will be required within the timber sale contract to minimize the need to construct new landings.
- New landings to be constructed will not be located within RRs and will be kept as small as feasible, while meeting safe working standards.

BMP 1.17 – Erosion Control on Skid Trails: The objective is to protect water quality by minimizing erosion and sedimentation derived from skid trails. This is accomplished during the operations phase of the project.

- Each skid trail will be water-barred before the beginning of the rainy season and before the sale is completed.
- Skid trails that intersect Forest Roads will be obliterated at the intersection.
- Skid trails that cross dry swales (i.e. depressions in the landscape that do not meet definition for a designation as an RR) will be restored before any storm (with reasonable chance of causing offsite sediment movement), or after use is complete. This generally consists of removing excess soil, reshaping and waterbarring former approaches, and spreading slash on the former crossing.
- Tractor skidding will be done when soil moisture conditions are dry within 4" of the surface on existing skid trails and dry to 10" of the ground surface off skid trails.

BMP 1.19 – Streamcourse Protection: The objective is: 1) to conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values; 2) to provide unobstructed passage of stormflows; 3) to control sediment and other pollutants entering streamcourses; and 4) to restore the natural course of any stream as soon as possible, where diversion of the stream has resulted from timber management activities.
The location of stream crossings must be agreed to by the Sale Administrator and the Hydrologist. The accomplishment of the objective of this measure is during the operations phase of the project.

- Service landings are located away from channels. Fuel containment systems will be used at all landings.
- Skid trails will be a minimum of 50 feet from the break in slope to the wetted stream channels or the inner gorge.
- Straw bales, rock, and containment dikes will be used as needed at water drafting sites and service landings to capture any spilled water and prevent runoff to streams.
- There will be no yarding of trees or logs below the break in slope or in inner gorge areas.

BMP 1.20 – Erosion Control Structure Maintenance: The objective is to ensure that constructed erosion control structures are stabilized and working. This is accomplished during the operations and post-operations phase of the project; this ensures the adequacy of erosion control measures.

- When stormy weather is predicted, the TSA will be on site to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.
- The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. The project earth scientist may be called

on to make recommendations to the TSA who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

- Temporary roads will be graded to outslope.
- A barrier to prevent vehicle traffic and use will be placed at all temporary road takeoffs at the end of the operating season.
- Temporary roads will be water-barred after use and then will be decommissioned at the end of the project.
- Klamath WWO guidelines will be followed. Spot rocking will used as necessary if small and isolated portions of the road system do not adequately dry to allow haul when most of the road is capable of haul, provided haul over the newly rocked areas will not create adverse impacts, such as sediment moving off site towards channels.

BMP 1.21 – Acceptance of Erosion Control Measures Before Timber Sale Closure: The objective is to ensure the adequacy of required erosion control work on timber sales. This is accomplished during the post-operations phase of the project during the contract final inspection.

- Landings will be shaped for drainage.
- Landings that will not be used again will be contour ripped and covered with slash or weed free straw if necessary.
- At project completion, permanent operating water bars will have been installed and-or repaired as necessary on all skid trails and cable corridors.
- Temporary roads will be graded to outslope.
- A barrier will be placed at the takeoff of the temporary roads.

BMP 1.25 – Modification of the Timber Sale Contract: The objective is to modify the TSC if new circumstances, or conditions indicate that the timber sale will damage soil, water, or watershed values.

- Modifications are not expected at this time but this BMP is retained to illustrate that contract alteration will occur if needed to insure maintenance of water quality, especially if unforeseen circumstances and impacts occur.

BMP 2.1 – General Guidelines for the Location and Design of Roads: The objective is to locate and design roads with minimal resource damage.

- Road construction will be designed:
  - For minimal cut and fill
  - On or near ridges
  - On gently sloping ground

  - Outside RRs
- Temporary roads were identified on the Project planning map and were evaluated by earth scientists.

BMP 2.2 - Erosion Control Plan: The objective is to limit and control sedimentation through effective planning prior to the initiation of construction activities and through effective contract administration. This is accomplished during the pre-operations and operations phase of the project.

- Resource protection measures are incorporated into the Preferred Alternative by the IDT and these actions are then incorporated into the contract specifications and provisions. Examples are most of the actions described above and include such items as: shaping landings, temporary roads and skid trails for drainage and use of rock as necessary to obtain suitable haul bases on FS roads.

- When stormy weather is predicted, the TSA will be in contact with the sale administrator to insure winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.

- The WWO Guidelines will be used to guide operations, especially haul, during periods of wet weather. The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. An earth scientist may be called on to make recommendations to the TSA who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

BMP 2.3 - Timing of Construction Activities: The objective is to minimize erosion by conducting operations during minimal runoff periods. This is accomplished during the operations phase of the project by the contract administrator and the project earth scientist.

- All landing and temporary road construction and existing landing and temporary road reconstruction, will be conducted during appropriate periods of weather and soil moisture to insure BMP attainment and the avoidance of adverse impacts to listed species. Forecast periods will also be of a suitable length to allow completion or winterization of the task undertaken before precipitation events occur.

- When stormy weather is predicted, TSA will be on site to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.

- The WWO Guidelines will be used to guide operations, especially haul, during periods of wet weather. The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. The project earth scientist may be called on to make recommendations to the TSA who will provide direction to the Timber Sale Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

BMP 2.4 – Stabilization of Road Slope Surfaces and Spoil Disposal Areas: The objective is to minimize erosion from exposed cut slopes, fill slopes, and spoil disposal areas.
This is accomplished during the operations phase of the Project.

- All landings, temporary road, and road re-conditioning will be conducted during appropriate periods of weather and soil moisture to insure BMP attainment and the avoidance of adverse effects to listed species. Favorable forecast periods will also be of a suitable length to allow completion or winterization of the task undertaken before precipitation events occur.

- Landings will be shaped for drainage at the time of construction. Rock armoring and silt fences with straw bales will be used as necessary to direct water to suitable areas of drainage and to capture sediment. All landing cut and fill slopes will be straw mulched and the mulch is maintained throughout the life of the Project.

- WWO will be followed. Rocking will be used as necessary.

- Temporary roads will be closed and outsloped when not in use (steeper segments will be mulched as needed).

- Temporary roads will be decommissioned within one year following completion of activities.

BMP 2.5 - Road Slope Stabilization Construction Practices: The objective is to reduce sedimentation by minimizing erosion from road slopes and slope failures along roads. This is accomplished by road design measures during the planning phase of the project.

- The Klamath NF's WWO guidelines will be followed.

- When stormy weather is predicted, the TSA will be on site to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil and forecast conditions exist.

- The WWO Guidelines will be used to guide operations, especially haul, during periods of wet weather. The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. The project earth scientist may be called on to make recommendations to the TSA who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

BMP 2.11 – Control of Sidecast Material During Construction and Maintenance: The objective is to minimize sediment production originating from material sidecast material during road construction or maintenance. This is accomplished during the design phase of the project by the contract inspector.

- Minor blading will occur on temporary roads used by the project. Side-casting of soil during blading operations will be minimal due to the low gradient slopes on which the temporary roads are located.

- During reconstruction of any landings, material will not be sidecast where it can enter a stream channel.

BMP 2.12 - Servicing and Refueling of Equipment: The objective is to prevent pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers,

streams and impoundments, or into natural or man-made channels. This is accomplished through the use of designed and designate refueling areas.

- Fuel containment systems will be in place on landings as necessary.
- Refueling and maintenance of Project motorized equipment will occur at least 200 feet away from any channel.

BMP 2.16 – Stream Crossings on Temporary Roads: The objective is to ensure that temporary roads do not unduly damage stream channels and to insure that fish passage is unimpeded by stream crossing structures.

- The number of crossings is kept to a minimum needed for access.
- Temporary crossings will be removed and the site stabilized prior to any storm (i.e., when there is significant potential for offsite sediment movement) or when the facility is no longer needed, whichever is earliest.

BMP 2.21 - Water Source Development Consistent with Water Quality Protection: The objective is to supply water for roads and fire protection while maintaining existing water quality.

- Drafting sites are existing sites and rocking of approaches will be used as required. All boards and plastic will be removed after use. Straw bales, rock surfacing and containment dikes will be used at all locations where the possibility of water spill or overflow will result in sediment being moved toward the creek.
- Drafting sites and methods will follow NOAA-Fisheries 2001direction including screen size and the amount of flow withdrawal guidelines when drafting from anadromous fish bearing stream reaches.
- Purchaser will be required to submit a water source development plan to the Forest Service prior to use.

BMP 2.22 – Maintenance of Roads: The objective is to maintain roads in a manner which provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities all of which can cause erosion and sedimentation, and deteriorating watershed conditions. This is accomplished during the operations phase of the project and the post-operations final inspection.

- The Klamath WWO guidelines will be followed. Spot rocking will used as necessary if small and isolated portions of the road system do not adequately dry to allow haul when most of the road is capable of haul, provided haul over the newly rocked areas will not create adverse impacts, such as sediment moving offsite towards channels.
- When stormy weather is predicted, the TSA will be on site to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil, and forecast conditions exist.

- The WWO Guidelines will be used to guide operations, especially haul, during periods of wet weather. The TSA will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of watershed impacts. The project earth scientist may be called on to make recommendations to the TSA who will provide direction to the Contractor as to when operations may resume to insure that BMPs will be met and adverse impacts will be avoided.

- Appropriate road watering will occur as roads dry to maintain road fines on site and minimize dust.

BMP 2.23 – Road Surface Treatment to Prevent Loss of Materials: The objective is to minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production from those areas. This is accomplished during the operations phase of the project.

- The Klamath WWO will be used for all Project activities (harvest, hauling). The public uses many roads within the analysis area throughout the year and control of this use is outside the scope of the Project or the KNF's jurisdiction.

- Spot rocking will used as necessary if small and isolated portions of the road system do not adequately dry to allow haul when most of the road is capable of haul, provided haul over the newly rocked areas will not create adverse impacts, such as sediment moving offsite towards channels.

- Landings will be outsloped and rocked if necessary to improve drainage away from existing channels.

- The WWO dictate conditions that control ground-disturbing operations. For example, if more than 10% of a road segment is rutted 2 inches in depth, road use will be suspended.

- TSAs will be on site daily when new locations and conditions are encountered and to insure that appropriate winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil and forecast conditions exist.

- A Dust Abatement Plan is required under the Timber Sale Contract, Specification CT5.4, under road maintenance. Roads to be dust abated with water will be specified in the contract by project engineer.

- Appropriate road watering on other project roads will occur as roads dry to maintain road fines on site.

BMP 2.24 – Traffic Control During Wet Periods: The objective is: 1) to reduce road surface disturbances and rutting of roads; and 2) to minimize sediment washing from disturbed road surfaces.

- The Klamath WWO Guidelines will be used for all project activities (hauling, fuel treatment, road opening and decommissioning), but the public uses many roads within the project area throughout the year.

- The WWO Guidelines dictate conditions that control ground-disturbing operations. For example, if more than 10% of a road segment is rutted 2 inches in depth road use will be suspended.

BMP 2.26 – Obliteration or Decommissioning of Roads: The objective is to reduce sediment generated from temporary roads, unneeded system (classified) and non-system (unclassified) roads by obliterating or decommissioning them at the completion of the intended use.

- This BMP applies to all temporary roads
- Roads are to be drained by measures such as re-contouring or outsloping to return the road prism to near natural hydrologic function.
- Road prisms requiring more sediment reduction would be stabilized through appropriate treatment such as tillage, ripping, fertilization, and/or revegetation.
- Road take-offs would be obliterated or effectively blocked to vehicle access.

BMP 5.2 – Slope Limitations for Mechanized Equipment Operation: The objective is to reduce gully and sheet erosion and associated sediment production by limiting tractor use.

- Ground-based skidding equipment (track or rubber tired) would be generally restricted to slopes ≤35%.
- Masticating equipment may operate on slopes up to 35%.

BMP 5.4 - Revegetation of Surface Disturbed Areas: The objective is to protect water quality by minimizing soil erosion through the stabilizing influence of vegetation foliage and root network. This is accomplished during the operations and post-operations phase of the project.

- Temporary roads that are decommissioned will be mulched and seeded in areas that have high erosion potential.
- Steep (>35%) portions of skid trails will be covered with slash as needed.

BMP 5.5 – Disposal of Organic Debris: The objective is to prevent gully and surface erosion with associated reduction in sediment production and turbidity during and after treatment.

- Hand pile and pile burning, underburning and mastication would be used to reduce the fine fuel component. Specified soil cover recommendations would be used to maintain sufficient soil cover for erosion prevention.

BMP 5.6 – Soil Moisture Limitations for Mechanical Equipment Operations: The objective is to prevent soil compaction, rutting, and gulling, with resultant sediment production and turbidity. This is accomplished during the operations phase of the Project by periodic monitoring performed by the Project's earth scientist.

- Tractor skidding will only be permitted when soil moisture is dry within the top 4" of the soil surface on main skid rails, and dry down to 10" when skidding off skid trails.

- When stormy weather is predicted, the TSA will be in contact with the sale administrator to insure winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil and forecast conditions exist.

- The WWO will be used to guide operations, especially haul, during periods of wet weather. Earth scientists will examine field conditions to determine when the soil and/or road have dried out enough to enable operations to resume without risk of adverse watershed effects. The earth scientist will make recommendations to the TSA who will provide direction to the Timber Sale Contractor as to when operations may resume to insure that BMPs will be met and adverse effects will be avoided.

- Mastication will occur when the soil is dry down to 10 inches.

BMP 6.1 – Fire and Fuel Management Activities: The objective is to reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity and extent of wildfire.

- The District Fuel/Fire department helped determined acceptable levels of slash to retain on the site following harvest activities and also to identify areas and methods to remove standing slash of a sub merchantable size, that otherwise would create an unacceptable fire risk.

- On-going fire management work maintains fire access plans and restricts public activities, such as woodcutting, on days when fire weather predictions indicate significant risk from such activities in the Project Area.

BMP 6.2 – Consideration of Water Quality in Formulating Fire Prescriptions: The objective is to provide for water quality protection while achieving management objectives through the use of prescribed fire. This is done during the planning phase of the project.

- The different fuel reduction treatments are being used because of soil and water quality considerations.

- All burning will be done under an approved Burn Plan that specifies a burn prescription for each area. These prescriptions will account for fuel loading, fuel moisture, soil moisture, slope, aspect, etc., and will result in the desired quantity of fuel consumed for each prescribed burn. A fuel management specialist, who may utilize recommendations from a soil or earth scientist, will prepare prescriptions.

- Hand piles will burn under controlled settings to contain fire spread.

- Underburning will occur under prescription, occurring in conditions that allow safe burning. Fire crews, equipped to control fire spread, will monitor underburning.

- Fire prescriptions will be reviewed by the IDT and will be approved by the line officer.

BMP 6.3 – Protection of Water Quality From Prescribed Fire Burning Effects: The objective is to maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.

- Retain recommended ground cover to keep soil erosion in the burned site within the limits of the burn plan and LRMP guidelines for soil cover (LRMP Table 4-2).

- Maintain the integrity of the riparian reserve.

- If it is determined necessary for a handline to be constructed as a control point within a Riparian Reserve, it should be constructed no closer than 30 feet to a watercourse. Handline construction in riparian vegetation shall be avoided where practical.

BMP 7.7 -- Management by Closure to Use (Seasonal, Temporary, and Permanent): The objective is to exclude activities that could result in damages to either resources or improvements, such as roads and trails, resulting in impaired water quality.

- The Mt. Ashland project is proposed to take place during the NOS that is defined as April 15 to October 15 and in dry periods outside the NOS with Line Officer approval. Activities will be restricted during periods of wet weather during the NOS.

- The Klamath WWO Standards will be used, however, public use of most roads within the Project Area occurs throughout the year. The *Wet Weather Operations Standards and Field Guide,* revised May 16, 2002, is incorporated by reference and on file in the Project record.

- Storms may make it necessary to temporarily suspend operations to insure BMP compliance and to avoid adverse effects to Threatened, Endangered, or Sensitive species. When stormy weather is predicted, The TSA will be on site to insure that winterization or erosion control procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations will not resume until suitable weather, soil and forecast conditions exist.

- In riparian reserves, prescribed fire effects will mimic a low intensity backing fire, except for burning handpiles where higher intensity may occur to consume pile material.

BMP 7.8 – Cumulative Off-Site Watershed Effects: The objective is to protect the identified beneficial uses of water from the combined effects of multiple management activities which individually may not create unacceptable effects but collectively may result in degraded water quality conditions.

- A cumulative watershed effects analysis was completed for the Project. Project design standards including Resource Protection Measures have been incorporated into the Preferred Alternative to minimize cumulative off-site watershed effect

Appendix E Scenery Design Standards

Mount Ashland LSR Project

Design Standards for Scenery

1. Thinning densities are spatially prescribed within portions of stands 340, 235 and 339 to reduce the unnatural appearance of previously logged areas.

2. Retain at least 85% of the large trees (28”+dbh) within 50 feet of the Pacific Crest Trail (stands 312, 313, 314, and 250), and 50% of the largest trees within 50 feet of the Beaver Creek to Mount Ashland link road (40S16/40S15 in stands 297, 432, 300, 405, 425, 426, 406, 438, 286, 247, 437, 337, 234, 343, and 342). Retain at least 50% of the smaller full crowned trees in varying sizes, tree groups, snags, hardwoods, shrubs and ground covers, within 200 feet of the Pacific Crest Trail in the stands listed above, as well as within visible areas 75 feet from the Beaver Creek to Mt. Ashland link road, in the stands listed above.

3. Flush cut stumps when visible from, and within 75 feet of the Pacific Crest Trail, in stands 312, 313, 314, and 250. Within 75-150 feet of the trail, cut visible stumps to a maximum height of 4-6” as measured from the uphill slope. Further conceal trailside stump contrasts or project associated ground disturbances until they become unnoticeable from the trail within 3 years, by covering them with dirt, duff or woody debris.

4. Cut stumps to a 6” maximum height (as measured from the uphill slope) when visible from within 50 feet slope distance of the Beaver Creek to Mount Ashland link road edge (segments of roads 40S16 and 40S15, within stands 297, 432, 300, 405, 425, 426, 406, 438, 286, 247, 437, 337, 234, 343, 342). As necessary to create only minor visible contrasts that do not dominate over the natural appearance of the roadside scenery within 3 years of completion of project activities, fully or partially cover stumps or project associated ground disturbances with dirt, duff or woody debris. This will typically be necessary only in areas with concentrations of stumps or stobs, or where individual exceptionally prominent stumps are created. Where underburning is planned, stump concealment is not necessary (color contrast of the stumps will typically be reduced through scorching).

5. To prevent unnatural appearing vertical linear openings in the forest canopy due to cable yarding corridors, retain at least 60% of the existing forest canopy cover within the yarding corridors of stands 236, 237, 250, 435, 243, 253, 206, 212, 207, 277 and 377. This may require an increased number of cable yarding corridors and/or the use of rub trees along the yarding corridors, or other methods, to reduce damage to retained trees and their screening branches.

6. Locate skid roads, and control use of mechanical equipment to minimize visibility of associated ground and vegetation disturbances as seen from the Pacific Crest National Scenic Trail in stands 312 and 313, and the Beaver Creek to Mt. Ashland link road (40S16/40S15) in stands 297, 432, 426, 286, 247, 337, 234, 343, 342 and 341.

7. Minimize the visibility of landings visible from the Beaver Creek to Mt. Ashland link road to the extent possible (40S16/40S15), ideally through partial or full vegetative screening. Where landings must be visible from the road, create an irregular, more natural appearing opening and edge when possible, protect adjacent trees, natural landform contours and adjacent water bodies; restore roadside settings and remove project associated debris.

8. Create an irregular, natural appearing mosaic of burn patterns and intensities within 300 feet of the Pacific Crest National Scenic Trail. Restore any unnatural appearing evidence of fire management along the trail to become unnoticed from the trail within 3 years.

9. Locate hand piles necessary within 50 feet of the Pacific Crest National Scenic Trail so that they are not visible or are largely screened from view. Piles will be completely burned to minimize visual impacts.

10. No mastication will occur within 150 feet of the Pacific Crest National Scenic Trail. Mastication along the Beaver Creek to Mt. Ashland link road shall achieve a clumpy and irregular distribution of undisturbed leave vegetation within 50 feet of the roadway, to appear as a natural appearing pattern with only minor visible disturbances within 3 years of project completion.

Below are photographic examples of immediate foreground road settings in which the above roadside design features would apply.

Appendix F Social Assessment Background

The Project's Link To Larger Planning Efforts

The assessment area for effects on social values is both local and nationwide, because these are public lands. Values are also a part of social well-being. A value is a shared standard of preference or desirability and several components of these values were assessed, based on public input, policy, law, and regulation.

The USDA USFS revised the Strategic Plan for the agency in February 2004, addressing plans for 2004-2008 (http://fsweb.rmrs.fs.fed.us/lt/LT_Strat_Plan0408.pdf) and the KNF completed a Business Plan in May 2006. Beginning in 2000, the goals and objectives included in the Strategic Plan were developed with input from the public, some of which was obtained through a telephone survey. Shields et al. (2002) reported the results of the survey and summarized it in their abstract: "Members of the American public were asked about their *values* with respect to public lands, *objectives* for the management of public lands, *beliefs* about the role the agency should play in fulfilling those *objectives*, and *attitudes* about the job the agency has been doing. The public sees the promotion of ecosystem health as an important objective and role for the agency. There is strong support for protecting watersheds. The public supports multiple uses, but not all uses equally. Motorized recreation is not a high priority objective, while preserving the ability to have a 'wilderness experience' is important. [The 'wilderness experience' value is not significantly relevant to this project because of the high road density in the Beaver Creek watershed.] There is moderate support for providing resources to dependent communities. The provision of less consumptive services is more important than those that are more consumptive. There is a lack of support for subsidies for development and leasing of public lands. Preservation of traditional uses is a somewhat important objective. Development and use of the best scientific information enjoys wide support, as does information sharing and collaboration. A national direction for the management of National Forest lands is a slightly important objective. Increasing law enforcement on National Forests and Grasslands is an important objective and an appropriate role for the agency. The public has a strong environmental protection orientation, has a moderately strong conservation/preservation orientation, and supports some development." The Strategic Plan for 2004-2008 concludes that goals and objectives in the Strategic Plan are responsive to the current and future resource conditions and societal demands presented in the RPA Assessment (USDA Forest Service 2001b), as well as to other sources cited in the Plan.

The KNF Business Plan uses both qualitative information, gathered primarily through interviews, and quantitative data. The plan describes the KNF strategies for promoting financially and ecologically sustainable forest management, and it provides a key internal and external communication tool for sharing the Forest leadership team's plans and expectation for the future. The Ashland LSR project is identified in the 2006 business plan (P. 38) under

Component 1.5 to "Maintain healthy vegetative condition by controlling density levels, to prevent mortality from insect, disease, drought and fire." More specifically, the Ashland LSR project is identified as part of the Forest's effort to improve habitats for threatened, endangered, or sensitive species that prefer late seral forest types.

A scoping letter, dated October 3, 2005, was sent to interested and potentially affected parties. A Notice of Intent to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on October 7, 2005. Two public meetings were held to discuss the landscape needs and the public interest. Letters or e-mails were received from 24 groups and individuals. Based on comments received during the scoping process for this proposal and other public involvement efforts for Forest projects, public values pertinent to forest management in the Project Area were identified.

Background Information To Determine The Affected Environment For The Ashland LSR Project

In the 1990s, the Forest contracted for a study on communities within the Klamath Region (Doak and Kusel 1997). The study examines the socioeconomic status and community capacity as indicators of the well-being of communities. Relative socioeconomic status was assessed using a scale of factors. "The design of the socioeconomic status scale assumes that higher levels of home ownership, education and employment indicate higher levels of socioeconomic well-being, and higher levels of poverty and higher percentages of children in homes receiving pubic (sic) assistance income indicate lower levels of socioeconomic well-being… Community capacity is defined as the collective ability of residents in a community to respond to external and internal stresses; to create and take advantage of opportunities; and to meet the needs of residents, diversely defined. Physical capital, human capital and social capital are the primary components of community capacity" (p. i).

The names and descriptions of the Aggregations and social well being is from Doak and Kusel's 1997 report on "Well-Being Assessment of Communities in the Klamath Region". Prepared for the United States Forest Service, KNF under contract 43-91W8-6-7077, October 20, 1997. **http://www.inforain.org/indicators/klamath**

Population data for the Aggregations came from http://www.inforain.org/indicators/klamath.
Population data for the town of Happy Camp: http://www.happycampchamber.com/community.html.
Population data for the town of Klamath River:
http://realestate.yahoo.com/Neighborhoods/detail.html?csz=Klamath%20River,CA.

Low **socioeconomic scores** highlight a range of societal needs within aggregations. Low **capacity scores** indicate a reduced ability of local communities to effectively address those needs and to self-develop.

The Description Of The Community Capacity Of Surrounding Communities

The communities below are listed in order based on geographic proximity to the Project Area with consideration of the population size, the likely social use of the Beaver Creek watershed based on the description of the social attributes by Doak and Kusel, 1997 and knowledge of populace's behavior. For example, residents of Happy Camp are more likely to drive by Beaver Creek watershed than Ashland or Hornbrook residents because Happy Camp residents travel to Yreka via highway 96 and pass the town of Klamath River and the mouth of Beaver Creek to get basic services in Yreka. Ashland and Hornbrook would receive services in Ashland or travel Highway 5 to Yreka without passing the Beaver Creek watershed. Hunting is a more common recreation in Happy Camp, Yreka, and Klamath River than in Ashland per the social description of these aggregations in Doak and Kusel, 1997. In general, the Beaver Creek watershed is not accessible to the Oregon communities for part of the year because roads get the presence of snow prohibits road access, ranking social use of the watershed higher for Siskiyou county residents than Ashland area residents. Ashland residents could be more concerned about fuels reduction in the watershed, but this was not expressed during the public scoping phases of the project…it is displayed via the development of the Ashland Resiliency project, EIS, Rogue-Siskiyou National Forest. The economic benefits from this project could go to either Oregon or California or both and are considered part of the existing integration of natural resource benefits of communities surrounding the area. The potential benefits of this project related to the restoration and protection of habitat for species listed under the ESA was not used in the consideration of prioritization because citizens in both Oregon and California communities have expressed an interest in managing natural resources wisely, including management of the habitat for species listed under the ESA.

The Project Area lies within the Happy Camp/Klamath River aggregation which is rated as medium for socio-economic and community capacity conditions. The description of this aggregation is somewhat overshadowed by the larger community of Happy Camp. The statements applicable to the small communities of Klamath River, Hamburg, and Seiad Valley follow: "Happy Camp/Klamath River is a remote, natural resource dependent community. Native Americans, most of whom are members of the Karuk Tribe, account for 17 percent of the population. Ten percent of the population is Hispanic. Long dependent on the timber industry, this area is evolving towards a greater dependence on recreation and tourism…. Based on the 1990 census data, 26 percent of workers are employed in the durable goods manufacturing sector, a level that has likely declined since the mill shut down. Thirteen percent are employed in the agriculture, forestry and fisheries sector, and 17 percent in retail services… (T)he 1990

unemployment rate of 18 percent is the highest in the subregion. Twenty-two percent of males are unemployed compared to 11 percent of women. Federal employees comprise 13 percent of the work force. Services are limited and there is no medical clinic in the area; residents must drive two hours to see a doctor or dentist. Most of the land is federally managed. Mobile homes and trailers make up 37 percent of the housing stock. There is a small population of higher educated residents, which includes teachers, business owners, and USFS employees. Collectively, residents are identified as "rugged individualists" with a variety of outdoors-oriented skills… One area the groups are working on is keeping schools open." (Doak and Kusel, 72–73).

The 2000 Census (U.S. Census Bureau 2000, Summary Social, Economic, and Housing Characteristics, Issued March 2003) did not show improvement in the employment figures for those employed outside the home, nor in per capita income in Siskiyou County. However, since 2000, communities along the Klamath River have shown increased willingness and ability to join together to accomplish important tasks related to improving watershed health and reducing unwanted fuel loading on private land. Some of this revitalization of community capacity was probably due to the financial assistance available through the National Fire Plan and the Secure Rural Schools and Community Development Act of 2001 for communities that banded together and sought opportunities for grants. More recent information on the social situation in the mid-Klamath River area is available in the case study conducted for the "Northwest Forest Plan: The First Ten Years, Socioeconomic Monitoring Results" by Susan Charnley and others of the Northwest Forest Plan Monitoring Group (Charnley pers. comm.; Boland pers. comm.).

The Kusel study states that almost every community meets around local volunteer fire departments and schools. Local fire safe councils, created since the study, increasingly play this role. The Klamath River Elementary School, kindergarten through grade 8, is open but has declining enrollment. The Klamath River Hose company (volunteer fire department) provides fire protection and fund-raising activities. The Klamath River Hose Company, which covers the area from Horse Creek to Humbug, maintains a station in Horse Creek. The Klamath River Fire Safe Council provides a means for community members to collaborate on fuel reduction projects.

> Other fire safe councils have formed to address the potential of and community response to Wildland fires near their community (http://www.firesafecouncil.org/find/index.cfm). The small community of Colestine in Jackson county, Oregon, also has a fire safe council called the Colstin (sic) Rural Fire District (http://crfd.org/wildlandfireprevention.htm). The council's geographic boundaries can be roughly described as: Just beyond Interstate 5 to the east, the Mt. Ashland ski road to the north, Cottonwood drainage to the west, and the California-Oregon border to the south. The fire council committee focuses on developed urban and suburban lands that are 10 acres in size or smaller, and which are grouped with other lots with similar characteristics. Owners of these lands will be required to reduce potentially

flammable vegetation around structures and along driveways. In 2005, the council developed a Colestin and Hilt Community Wildfire Protection Plan http://www.crfd.org/CWPP_ (without Appendices).pdf. Although not in the Project Area or in the Beaver Creek watershed, fuels reduction efforts in the Project Area may be of interest to the council.

Community-Social Aggregation	Population	Socio-economic condition (1 to 7)	Community Capacity condition (1 to 5)	Geographic distance to Beaver Creek watershed (at mouth of the Beaver Creek at the Klamath River and the top of the watershed at the ski area). The Project Area is in the mid watershed area and near the crest of the watershed.[1]
Klamath River (Happy Camp/Klamath River Aggregation)	445 (Klamath River community only)	4	3	1 mile to mouth of Beaver Creek 55 miles to the Mt Shasta Ski area in winter
Happy Camp (Happy Camp/Klamath River Aggregation)	1,277 people were counted during the year 2000 census in Happy Camp. Aggregation population: 2,876	4	3	47 miles HC to mouth of Beaver Creek 72 miles to Ashland Ski area
Yreka	7,971	4	5	28.4 miles to mouth of Beaver Creek 36 miles Mt Ashland Ski area
Hornbrook/Hilt	717	5	1	28.8 miles to mouth of Beaver Creek 15 miles to Mt Ashland Ski area
Montague	(This is not a separate aggregation. It is included within the Yreka aggregation.)	n/a	n/a	36 miles to mouth of Beaver Creek 42 miles to Mt Ashland Ski Area
Colestine	3,744	4	2	47.5 miles to mouth of Beaver Creek 10 miles to Mt Ashland ski Area
Ashland	17,588	5	5	45.4 miles to mouth of Beaver Creek 20 miles to Mt Ashland Ski area
Ashland/Lincoln-Pinehurst (town of	1,394	7	2	58.2 to mouth of Beaver Creek 32 miles to Mt Ashland ski area

[1] The sources of distances between communities/aggregations and the top and bottom of the Beaver Creek watershed were from http://www.ashlandinn.com/act.html, and yahoo.com driving directions, and Mt Ashland ski area websites)

Community-Social Aggregation	Population	Socio-economic condition (1 to 7)	Community Capacity condition (1 to 5)	Geographic distance to Beaver Creek watershed (at mouth of the Beaver Creek at the Klamath River and the top of the watershed at the ski area). The Project Area is in the mid watershed area and near the crest of the watershed.[1]
Pinehurst)				
Medford	57,387	4	5	58 miles to mouth of Beaver Creek 33 miles to Mt Ashland ski area
Nearest off-ramp on Highway 5	n/a	n/a	n/a	8 miles to Mt Ashland Ski Area
Nearest off-ramp on Highway 5	n/a	n/a	n/a	21.1 miles to mouth of Beaver Creek

The Project Area is also associated with the Hornbrook/Hilt aggregation, the Yreka aggregation, the Ashland aggregation, and the Ashland/Lincoln-Pinehurst aggregation. The Hornbrook/Hilt aggregation has a low community capacity, with a medium-high socioeconomic condition -- one of the highest in the subregion, perhaps because some workers commute to Medford and Yreka. For the Yreka aggregation, good planning 20 years ago has led to sound physical infrastructure in Yreka today (socioeconomic condition is medium, with a high community capacity condition). Fire services and law enforcement are also good. Based on the 1990 census data, 62 percent of residents over 25 years of age have only a high school education and/or some college (but no degree), which is average for the region. Current education levels are likely to have increased with the recent opening of the new hospital. The hospital and new YMCA exemplify the ability of the community to work together and accomplish projects. The poverty rate is second lowest in the subregion at nine percent. Yreka, the county seat, has little divisiveness, and groups in the community, such as the chamber of commerce and city council, among others, work well. The Process Technology Training Center at the College of the Siskiyous is focused on developing a more skilled work force. Yreka's adjacency to Interstate 5 attracts commercial traffic, but retail sales are limited due to the relatively close proximity to Medford (http://www.inforain.org/indicators/klamath/pg17.htm).

The Ashland aggregation rates medium high for socioeconomic status and high for community capacity. Ashland is a community with a vision for its future. It has a skilled and highly educated populace that drives a diverse economy that includes tourism and education as well as some secondary wood products manufacturing. Two-thirds of all workers in Ashland have management related occupations. While there is a manufacturing sector in the local economy, only eight percent of workers have occupations as operators, fabricators or

laborers, the fifth lowest percentage in this category in the Klamath region. Non-profit organizations have a significant presence in Ashland, with 11 percent of workers employed by non-profit groups (http://www.inforain.org/indicators/klamath/pg16.htm).

There is also a community aggregation along the I-5 corridor, the Ashland/Lincoln-Pinehurst aggregation with a population of 1,394). Ashland/Lincoln-Pinehurst is a rural corridor. The area lacks infrastructure and is primarily a bedroom community of Ashland. This aggregation has one of the highest socioeconomic status scores in the region, yet has only a medium low capacity score. Like neighboring Ashland, residents are well educated, and have the fifth highest education score in the Klamath region. Thirty-one percent of residents 25 years of age or more have a four-year college degree or higher graduate level education. The poverty rate is low at seven percent, and there are no children under the age of 15 living in households receiving public assistance income. Some residents are involved in resource related work, and others are service workers and artists who commute to Ashland for work. While human capital in this aggregation is high, physical capital is limited and social capital in turmoil. Community cohesion is constrained by conflict between liberals and conservatives, although recent efforts to work collaboratively have occurred. The Pinehurst School, with 30 students in eight grades, is in financial trouble. With a high cost per student ratio, the school cannot continue to operate on limited state funding. Residents are banding together to keep the school operating. The Friends of Greensprings Association is also striving to enhance the local community.

The area of influence for broader social effects is the seven-county area described on p. 3-134 of the LRMP EIS (USDA Forest Service 1995b). Traditionally, the Forest's contribution to job creation within the area of influence was primarily related to timber production. People from the seven-county area contract for work in the area surrounding the project including, but not limited to, logging, planting, precommercial thinning, masticating, laborers, light industry, non- profit groups, and services related to those endeavors. These people spend money on gas and food, which creates a small multiplier effect in Siskiyou County.

With the reduction in timber outputs that occurred over the last several decades, in particular the reductions associated with the ROD for Amendments to USFS and BLM Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan) and Forest Plan, the USFS has expanded its role and tourism makes up a increased portion of revenue (in Ashland, for example). Grants are important in the seven-county area of influence. Since 1992, community development and similar programs intended to help build local capacity and accomplish resource goals have contributed significantly to economic stability and growth in Siskiyou and the surrounding counties. These programs include Jobs-in-the-Woods, the Rural Community Assistance program, Community Economic Revitalization Team, National Fire Plan Grant programs, and Payments to States Title II. The Forest also contributes to the job training and retraining programs that help the workforce in the seven-county area adjust to changes in resource products, markets, and skills. Refer to Forest Monitoring Reports (USDA Forest Service 2001c, 2003b, 2004, 2006c) for additional information; they are available on the Forest web page at the following web address: www.fs.fed.us/r5/klamath/projects/forestmanagement/

Appendix G Nonsignificant Issues-Disposition of Scoping Comments

A scoping letter, dated October 3, 2005, was sent to interested and potentially affected parties. A Notice of Intent to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on October 7, 2005. Letters or e-mails were received from 26 groups and individuals. Some group representatives commented more than once. The letters or e-mails received were from the following people and are numbered for tracking:

1. George Sexton, Conservation Director, representing Klamath Siskiyou Wildlands Center, Environmental Protection Information Center, Cascadia Wildlands Project, Klamath Forest Alliance, and Siskiyou Regional Education Project; Ashland, OR; Letter #1.

Roger Wilson Galbraith, Crescent City, OR; Letter #2.
Benjamin Harlow, Medford, OR; Letter #3.
Michael W. Letourneau, Environmental Scientist, United States Environmental Protection Agency, Region 10; Seattle, WA; Letter #4.
Regina Chichizola, Conservation Coordinator, Klamath Forest Alliance; Somes Bar, CA; E-mail - Letter #5.
Derek Volkart, Ashland, OR; E-mail - Letter #6.
Suzanne Savoie and Luke Ruediger, Jacksonville, OR; Letter #7.
Robert Schwartz, Ashland, OR; E-mail - Letter #8.
Lydia Garvey, Clinton, OK; E-mail - Letter #9.
Benjamin Grund, Ashland, OR; E-mail - Letter #10.
Mark Johnson, Grants Pass, OR; E-mail - Letter #11.
Jim Bender, Oregon; E-mail - Letter #12.
Dave Puritz, puritz7@hotmail.com; E-mail - Letter #13.
Ms. Allison Laughlin, Ashland, OR; Letter #14.
Connie Royer, Trail, OR; Letter #15.
Jan Rice, Medford, OR; Letter #16.
Frank T. Jones, Medford, OR; Letter #17.
Pamela Borich, Ashland, OR; Letter #18.
Vince Oredson, Wildlife Habitat Biologist, Oregon Department of Fish and Wildlife; Central Point, OR; Letter #19.
Felice Pace, Klamath, CA; E-mail - Letter #20.
Jay Lininger, Ashland, OR; E-mail - Letter #21.
Chandra LeGrue, Oregon Natural Resources Council, Eugene, OR; Letter #22.
B. Sachau, Florham Park, NJ; E-mail - Letter #23.
J. Michael Fay, Washington, DC: E-mail - Letter #24.
Eric Navickas, Ashland, OR; Written comments from open house – Letter #25.
Richard Svilich, American Forest Resource Council, Yreka, CA; Letter #26.

The following table shows the disposition of comments from the letters and e-mails. The first column includes the comments made. Many comments are paraphrased and similar comments are combined. The second column indicates the source(s) of the comment. Commenter numbers are as indicated above. The third column shows the response to each comment. Issues are identified in the third column; issues are points of discussion, dispute, or debate about the proposed action based on some anticipated effect. Issues are categorized as significant or non-significant for this proposal. Significant issues are based on the extent, duration, and intensity of the issue. They will be given substantial treatment in Chapter 3 of the EIS. Non-significant issues are discussed only briefly in this document, in the body of the EIS, or in another appendix. Other (non-issue) comments are categorized as procedural, other concerns, questions, comments or as proposed alternatives.

Table G-1 Disposition of Scoping Comments

Scoping Comment	Commenter or letter number:	Disposition
The agency's scoping notice does not allow for substantive and meaningful public scoping regarding this project. The scoping notice does not provide the level of detail necessary for the public to collaboratively participate in this HFRA NEPA planning process.	1, 5, 20, 21, 22	Procedural Comment. The Forest collaborated with the Yreka Field Office of the FWS to develop a Proposed Action that restores and protects habitat for late-successional associated species, with an emphasis on Threatened species. The Forest provided opportunities for early and meaningful public participation through meetings, field trips, scoping, and an open house. Notice of the proposal first appeared in the July 2004 Schedule of Proposed Actions for the KNF. In order to introduce the project to interested members of the public, a public meeting and field trip was held on September 29, 2004. In order to solicit ideas, information, site-specific issues and possible alternatives from the public, a scoping letter, dated October 3, 2005, was mailed to 33 people and groups who expressed interest in the proposal, who owned property adjacent to the Project Area, and to agencies with responsibilities for local resource management. The scoping letter included information about who is proposing the project (FS and FWS), what the project is, and where the project is located. In order to provide more specific information and maps about the developing project, another public meeting was held on October 28, 2005, followed by a field trip to the Project Area on October 29, 2005. Notice of the public meeting and field trip were sent to 164 individuals, groups, agencies and newspapers. Consultation was initiated with the Karuk Tribe of California, the Quartz Valley Reservation, the Yurok Tribe, and the Hoopa Tribe through public meeting notices and the scoping letter dated October 3, 2005. A public open house was conducted on November 16, 2006; notice of the open house was sent to 68 people, including everyone who had responded to scoping. The purpose of the open house was to share information on the progress of the project, to display minor changes to the proposed action that resulted from field reconnaissance, and to show how scoping information was used to develop alternatives. Public participation will continue with review of the Draft EIS.
The alternatives presented fail to meet the requirement	25	Procedural Comment. The range of alternatives is consistent with NEPA and HFRA. Although HFRA requires the analysis of only the proposed action, a no-action alternative, and one additional action

Scoping Comment	Commenter or letter number:	Disposition
of a broad range of alternatives.		alternative (Section 104(c)), the Forest has decided to fully analyze the no-action and three action alternatives (including the proposed action) in order to compare methods of achieving the purpose and need and in response to significant issues relating to water quality and temporary spur road construction. Several other alternatives were proposed but were eliminated from detailed study as described in Chapter 2.
The "broadly representative" local involvement required by the HFRA must extend beyond the solicitation of public comments in a scoping notice.	21	Procedural Comment. Public participation process is described above under Comment 1 and in Chapter 2.
General		
Timber harvest and road building may adversely affect sources of drinking water for communities.	4	Significant Issue. Effects on water quality and beneficial uses are discussed in Chapter 3, Aquatic Resources Section.
Project activities may impact endangered, threatened, candidate, or state sensitive species.	4	Other concern. Although the project may impact listed species, there will be no significant adverse effects to fish or wildlife. The proposed project is designed to implement Forest Standards for snags and coarse woody debris; maintain connectivity of habitat; maintain late-successional forest habitat; and maintain special habitat elements such as hardwoods, snag patches, mistletoe clumps, riparian areas, etc. This project is also designed to be consistent with the ESA. Thus, impacts to habitat required by endangered, threatened, candidate, or state sensitive species is expected to be minimal (refer to Mt. Ashland LSR Project Biological Assessment/Evaluation for Wildlife (USDA Forest Service 2007m) (Wildlife BA/BE) and Mt. Ashland LSR Project Management Indicator Species Project Level Assessment (Johnson and Thomas 2006)) (Project MIS Assessment). There will be no adverse effects to fish. The only project activities within CH for Coho Salmon are water drafting (2 locations, Beaver Creek and Cow Creek). NOAA Water Drafting Specifications (USDC NMFS 2001) will minimize impacts to juvenile coho salmon. Water drafting will not occur during the time that adult coho salmon are spawning in Beaver Creek and Cow Creek since adult coho salmon spawn during the late fall and early winter months (mid November to late January). No other project activities occur within CH. project design features, resource protection measures and BMPs will minimize impacts to anadromous fish and resident rainbow trout (refer to the Mt. Ashland LSR Project Biological Assessment/Evaluation for Fish (B. Thomas 2007b).
Project activities may result in habitat fragmentation and reduced connectivity. Activities may affect	4, 5	Non-Significant Issue. This Issue is conjectural and not supported by factual evidence. The Proposed Project is designed to restore and maintain habitat for late-successional forest related species; treatments would result in a long-term improvement of forested stand condition with an increased resilience to catastrophic wildfire

Scoping Comment	Commenter or letter number:	Disposition
corridors, migration routes, areas of wildlife and fish congregation.		and eventually provide for larger blocks of contiguous habitat (less fragmentation). It will not result in the loss or fragmentation of functioning late-successional forest habitat. The Proposed Project is designed to minimize fragmentation and maintain habitat connectivity by retaining important habitat components such as snags, DWD, large trees, etc., and leaving a minimum of 15% of each stand unthinned and by retaining the following canopy closures on the remainder of the stand: on average 60% or greater canopy on the lower ½ and 40-60% on the upper ½ of north and east aspects, 50-60% on the lower ½ and 40-50% canopy on the upper ½ of south and west aspects, and 30-60% on DFPZs (refer to discussion in Chapter 3, Wildlife and Habitats Section). The only project activities within anadromous fish habitat are water drafting (2 locations, Beaver Creek and Cow Creek). NOAA Water Drafting Specifications (USDC NMFS 2001) will minimize impacts to juvenile anadromous fish. Water drafting will not occur during the time that adult anadromous fish (coho salmon and steelhead trout) are spawning (congregating) in Beaver Creek and Cow Creek since adult coho salmon spawn during the late fall and early winter months (mid November to late January), and steelhead trout spawn during the late winter and spring months (late February to mid May). The only other project activity occurring within stream channels is temporary road construction and decommissioning of roads after project activities are completed. There are two locations where temporary road construction will occur at stream channel crossings. These locations are 1.6 and 2.25 miles upstream of anadromous fish habitat (congregation areas), respectively. Resource protection measures and BMPs will minimize impacts to anadromous fish and their habitat (refer to the Fish (BA/BE).
This project will violate the sediment standard and is illegal under Northcoast Basin Plan/CWA.	20	Non-significant Issue. This issue is conjectural and not supported by factual evidence. The action alternatives were designed to be consistent with the Basin Plan, Clean Water Act, and Forest Plan by use of Best Management Practices (BMPs). Implementing BMPs is considered sufficient to protect water quality. The role BMPs play in meeting the CWA and State water quality standards has been described by EPA in a guidance document titled SAM-32 (1987). This guidance established the policy that Best Management Practices are the primary method for controlling non-point pollution (e.g., Forest management activities) and achieving water quality standards. By agreement, use of the BMP process constitutes compliance with the Clean Water Act even in circumstances where water quality standards are not yet achieved. The Best Management Practice Evaluation Program is used by National Forests in California to evaluate implementation and effectiveness of specific BMP prescriptions, and to initiate adaptive changes to those prescriptions, or to BMPs themselves. In this way, BMPs are designed, applied, evaluated, and adapted to achieve full compliance with water quality standards over time. Activities on the KNF are monitored regularly to confirm implementation and effectiveness of BMPs. Annual BMP Effectiveness Program monitoring reports are located in the project

Scoping Comment	Commenter or letter number:	Disposition
		files and on the internet at http://www.fs.fed.us/r5/klamath/projects/forestmanagement/index.shtml. Refer to discussion in Chapter 3, Aquatic Resources Section and the Soil Report (Laurent 2007a).
Proposed activities would impact significant values of the Cottonwood Creek-Medusa Flats Roadless Area.	22	Non-Significant Issue. This is outside the scope of the proposal. The project is not within any inventoried roadless areas. There are no proposed road actions within the Cottonwood Creek-Medusa Flats area.
Special status species surveys must be conducted prior to developing alternatives and before the decision is determined.	22	Procedural concern. Surveys will be completed prior to implementation for all species for which surveys are required by law, by the Survey and Manage Standards and Guidelines, or by Forest Plan direction. Surveys have been conducted in the vicinity for the following special status species: NSOs, northern goshawks, great gray owls, willow flycatchers, fisher, and marten, plants and fish (stream surveys). Surveys for NSOs have been conducted for 2 years and will continue after the project is implemented. The Project Area was evaluated for the presence of habitat for all special status species (ESA listed, Sensitive, MIS, Survey and Manage) (refer to the Wildlife, Fish and Plant Project BA/BEs).
How does snowmobile access impact LSRs and associated species? How would reducing density of stands affect access for snowmobilers?	6	Question. Past timber management and naturally open higher elevation stands and meadows allow snowmobile access into the upper portion of the LSR. Current snowmobile access and use in that area is outside the scope of this project. Off-road snowmobile access in the vicinity of proposed treatments is limited by steep terrain. It is not expected that reducing stand density (thinning) or removing ladder and ground fuels would significantly affect snowmobile access. Temporary spur roads constructed for the project will be closed afterward and additional roads will be closed or decommissioned, thereby minimizing access.
Do you have any ideas for how to police illegal access [of snowmobiles]?	6	Question. This is outside the scope of the project. Policing illegal activities is a law-enforcement issue.
Old growth forests: protect untouched Old Growth Forests.	3,7,18	Comment. Old-growth forest conditions are rare on this landscape due to past logging. Untouched old-growth does not occur in the Project Area. Old-growth trees were not considered for silvicultural treatment in this project; they will not be affected by the project.
Traditional silvicultural tools are constructed to produce wood crops, not prevent high intensity fires, and quantitative methods necessary for creating and maintaining stands resistant to canopy fires are lacking.	1	Other Concern. A mixture of fuels treatments, including thinning, are proposed to meet the objective of reducing fuels. Reducing fuels will create more fire resilient stands, influence fire behavior, and increase suppression effectiveness. Although thinning is a silvicultural treatment, it is an effective tool for modifying forest structure to reduce fuels. Forest management through the application of thinnings…can alter species composition and stand structure. Classically, the term “thinning” was applied to stand treatments aimed at redistributing growth on remaining stems, but often any kind of partial cutting such as cleaning, weeding, liberation, preparatory, improvement, sanitation, and selection cuttings could be termed thinning. In all cases these treatments reduce the numbers of stems in a forest stand and can create an

Scoping Comment	Commenter or letter number:	Disposition
		infinite number of stand structures (Graham et al. 2004). These kinds of treatments can be applied to alter forest species composition and structure to meet management objectives such as…altering fire behavior and/or severity (ibid). Stand attributes were quantitatively measured in FIA plots and data was used to model the effects of proposed treatments (refer to Vegetation and Fire/Fuels sections in Chapter 3). Monitoring will continue as described in the Monitoring section of Chapter 2.
The plan should address timing of Project Area entry and access.	4	Other Concern. Timing of project activities is addressed in Chapter 2, Conservation Measures. Implementation is guided by wildlife seasonal restrictions and wet weather operation standards (USDA Forest Service 2002a).
It is awkward to try to achieve both a project that will pay for itself while achieving the appropriate management of the LSR. Approach the management of the LSR while asking what does this LSR truly need.	6	Other Concern. The purpose and need and proposed actions for the project are discussed in Chapters 1 and 2 and were developed using high priority recommendations from planning documents such as the Forest-wide LSR Assessment , the Mt. Ashland LSR Assessment, and the Beaver Creek Ecosystem Analysis (USDA Forest Service 1996a, 1996b, 1999). Timber harvest and biomass removal may be used as tools to implement the proposed actions, and sale of wood products may off-set the cost of implementation, but the project was not designed to generate revenue. It is anticipated that outside funds will be needed to complete the project. The estimated cost of implementing the project was analyzed in the Economic Report (Young 2006) and is summarized in Chapter 3, Social Section.
Several light-handed individual tree marked salvage sales would be good forestry and would develop income and provide a few jobs.	11	Other Concern. The need for the project is to promote development of late-successional forest and reduce fuels. Thinning was identified as the best silvicultural treatment to achieve project objectives (refer to Chapter 3, Vegetation Section). Benefits to local communities are discussed in Chapter 3, Social Section.
ODFW believes that fire suppression, curtailment of logging, single species/age regeneration and un-naturally dense stands has lead to a critical lack of forage for black-tailed deer.	19	Other Concern. The Project Area is located within an LSR which is managed for late-successional forest related species. Activities are designed to promote development of late-successional forest habitat and, while deer may benefit from a minor increase in forage in thinned and/or burned stands, it is not an objective of the project.
ODFW supports attempts to increase plant diversity, especially the encouragement of hardwood species, the increased use of fire as a management tool, and creating a balanced range of	19	Other Concern. The proposed project will retain hardwoods in treatment stands, will use fire as a management tool and will promote the development of late-successional forest in an area with an abundance of mid-successional forest due to past logging.

Scoping Comment	Commenter or letter number:	Disposition
vegetation seral states.		
The EIS should acknowledge the futility of backcountry fire suppression, and disclose the range of indirect and cumulative environmental impacts that inevitably result from the FS's institutional war on wildland fire.	21	Non-Significant Issue. Current Forest management direction calls for the suppression of wildland fires based on the appropriate suppression response (USDA Forest Service 1995a, 22-2) and using minimum impact suppression methods (USDA Forest Service 1995a, 22-3). The Forest Service's use of fire suppression tactics on wildland fires in backcountry and elsewhere in the National Forest System is outside the scope of this project.
The fuels reduction program is a guise to help the local logging industry.	23	Other Concern. Development of the fuels reduction program on the Forest is outside the scope of this project. The project includes fuels reduction activities, such as hand-piling, underburning, thinning of small diameter material, and mastication, to meet project objectives.
Alternatives		
Please just drop your plans.	24	Proposed Alternative. This is the same as the "no action" alternative. The comparison of the no action and action alternatives can be found in Chapter 3.
We hereby submit a Citizen's Alternative to meet the PandN by variable density thinning of trees less than 20 inches diameter, hand treatment of ground and ladder fuels in Riparian Reserves, and underburning, hand piling, and lop and scatter fuels treatments in and near harvest units.	1, 5, 6, 22	Proposed Alternative. This alternative was considered but eliminated from detailed study as discussed in Chapter 2. Alternative 2, the Proposed Action, includes variable density thinning of trees less than 20 inches in habitat promotion stands with the exception of hazard trees. Thinning in stands associated with DFPZs may include removal of trees over 20 inches. The Proposed Action includes hand treatment of ground and ladder fuels in Riparian Reserves, and underburning, and hand piling.
We do not believe that new road construction, mechanical slashbusting and fuelbreak construction are appropriate sideboards to the thinning activities.	1, 5, 22	Proposed Alternative. This alternative is the same as the "Citizen's Alternative" described above, refer to Response 22.
Drop all new roading; confine road re-building to flatter areas; do not log any trees over 20 inches	5	Proposed Alternative. This alternative is similar to the Proposed Action with the exception of the retention of 60% canopy closure. Retention of 60% canopy in all stands regardless of slope and aspect would not meet project objectives. Refer to the description of alternatives in Chapter 2.

Scoping Comment	Commenter or letter number:	Disposition
unless hazardous; avoid ground based equipment except on slopes that are fairly flat, on stable soils or next to roads; increase diversity; do not include landings in usable habitat; retain 60% canopy in all areas of harvest; and areas with spotted owls should be deferred from harvest.		An alternative that does not include temporary spur roads was developed and was eliminated from detailed study. A description of that alternative and the reason it was not carried forward can be found in Chapter 2.
It is reasonable to develop an action alternative to achieve the PandN for the project that does not require new road construction through this LSR.	1, 2	Proposed Alternative. Alternative 3 was developed with no temporary spur road construction. The alternative was considered but eliminated from detailed study as discussed in Chapter 2.
The agency should use a 12 inch diameter limit to enhance public confidence that this is not another timber grab.	22	Proposed Alternative. Limiting the proposed silvicultural treatments to trees less than 12 inches will not meet the purpose and need for the project (refer to Chapter 1, Purpose and Need, and Chapter 3, Vegetation Section). Alternatives 2, 4 and 5 include retention of trees >20 inches DBH to the extent possible in order to meet project objectives for promoting and maintain late-successional forest habitat.
Avoid new road construction and fuel breaks.	2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18	Proposed Alternative. Refer to Responses to Comments 22, 23 and 24.
Consider staying out of the red fir.	6	Proposed Alternative. Except for Stand 250, high elevation true fir (red fir) stands were omitted from the Proposed Action. During field reconnaissance of the proposed Project Area, the ID Team found that, although high elevation true fir stands, with the exception of stand 250, were typed as mid-successional, they were actually older (late-successional) and were not likely to respond well to thinning. They also exhibited signs of decadence which are important to some wildlife species. For these reasons, high elevation true fir stands were not considered further for habitat restoration/improvement. Because stand 250 provides habitat connectivity to the top of the Siskiyou Crest, a thinning and fuels treatment was designed with the objective of retaining this stand over time.
Don't remove old-growth	10, 13, 14, 16	Proposed Alternative. Old-growth and late-successional mixed conifer stands in the LSR and scattered throughout Project Area were not considered for silvicultural treatment in this project
I encourage light-handed salvage sales of dead, dying	11	Proposed Alternative. Hazard trees will be removed along roads within the Project Area and along haul routes in the Beaver Creek drainage (40S16, 41S07, and Road 11). Ward's Gap is outside of

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and over-ripe trees, especially on the Beaver Creek/Ward's Gap road system.		the Project Area.
A strict diameter limit should be applied to all fuel break units.	5	Proposed Alternative. All of the action alternatives include variable density thinning of trees less than 20 inches in habitat promotion stands with the exception of hazard trees. Thinning in stands associated with DFPZs may include removal of trees over 20 inches where it meets project objectives; however, this is expected to be a rare event.
Utilize existing system roads, skid roads, natural features, and existing breaks in vegetation to construct fuel break.	6	Proposed Alternative. All action alternatives utilize natural features as DFPZs. The DFPZs are overlaid on five major ridges within the Project Area. Existing roads and old skid trails are incorporated into DFPZs when they are consistent with objectives and ridge-top locations of DFPZs (refer to Chapter 2, description of alternatives).
A 20 inch diameter cap would instill a trust tool and help to move the project forward. The diameter cap is an important tool to have in this project.	6	Proposed Alternative. All of the action alternatives include variable density thinning of trees less than 20 inches in habitat promotion stands with the exception of hazard trees. Thinning in stands associated with DFPZs may include the occasional removal of trees over 20 inches.
Treatment should protect the largest and oldest trees with the best likelihood of contributing to desired late-successional forest structure, which the LSRA placed in the range of 11-17" in diameter.	1	Proposed Alternative. The proposed project is designed to protect the largest, oldest, most structurally diverse trees by retaining trees over 20 inches to the extent possible in habitat promotion stands. Not thinning trees in the 11-17" range would prevent the project from meeting its purpose and need as trees in this range are partly responsible for the overstocked condition of many stands. Thinning prescriptions will be designed to leave the healthiest most vigorous trees within the 11-17" diameter range, thus favoring the trees most likely to develop late successional characteristics.
Conservationist organizations strongly advocate that fuels reduction efforts should be focused in the WUI zone to create defensible space around dispersed individual homes and protective buffers around rural communities (versus in the backcountry).	1	Other concern. The Forest Fuels Program places emphasis for project development on WUI Zones. The Mt. Ashland LSR project is part of the Forest Wildlife Program where the emphasis is on habitat restoration and protection. This is a cooperative wildlife project with the USFWS that is consistent with HFRA and proposes to provide enhanced protection from catastrophic wildfire for threatened species and their habitat.
Temp Spur Construction		
Road construction	1, 4, 5, 7,	Significant Issue. Effects of spur road construction on soils are

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results in long-term impacts to soil health and forest habitat, such as soil displacement, soil erosion, mass wasting, reduced slope stability, compaction and loss of productivity.	21, 22	discussed in Chapter 3, Soil Resource Section.
Restoring roads by ripping or subsoiling can increase degradation of soil.	1	Non-Significant Issue. This issue is conjectural and not supported by evidence. Effects of ripping/subsoiling compacted road surfaces increase the soil porosity recovery rate compared to non-subsoiled soils (Froehlich et al. 1985). Subsoiling increases vegetative growth on roads compared to roads not subsoiled. Subsoiling increases water infiltration rates, reduces runoff, and reduces erosion. Subsoiling of roads can also prevent vehicle access which helps to protect soil and water resources. Subsoiling is a common rehabilitation practice to restore soil porosity, infiltration, and plant growth.
New logging roads are not appropriate in LSRs due to fragmentation of habitat, effects on distribution and movement, increasing edge habitat thus reducing interior habitat, and increasing harassment to wildlife. Both Long John and Grouse Creek watersheds currently have high road densities at over 2 miles/mile^2.	1, 4, 5, 7, 16, 22, 25	Significant Issue. Effects of spur road construction on road density and habitat are discussed in Chapter 3, Wildlife Resource Section.
Road construction may result in sedimentation, altered thermal processes and lower water quality.	1, 4, 5, 16, 21, 22	Significant Issue. Effects on Water Quality are discussed in Chapter 3, Aquatic Resource Section.
Road construction will limit salmonid reproduction by sedimentation and habitat simplification. Road construction may result in altered thermal processes	1, 4, 5, 16, 21, 22	Significant Issue. Effects on Water Quality are discussed in Chapter 3, Aquatic Resource Section. There are only two locations where temporary road construction will occur at stream channel crossings. These roads will be decommissioned after project activities are completed. These locations are 1.6 and 2.25 miles upstream of anadromous fish habitat, respectively. Resource protection measures and BMPs will minimize impacts to anadromous fish and their habitat from construction and

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and may impact fish habitat.		subsequent decommissioning of these two temporary roads. The other proposed temporary roads in the Project Area are not located within Riparian Reserves nor are they hydrologically connected to any stream channels.
Road construction may exacerbate spread of noxious weeds.	4, 7, 22	Non-Significant Issue. This is covered by regulation and policy. USFS Manual 2080 provides direction for assessing and minimizing the risk of noxious weed spread and pathogens. Resource protection measures have been integrated into the project to minimize spread of noxious weeds. Refer to Chapter 3, Vegetation Section and the Noxious Weed Risk Assessment in the project file
Road construction may increase fire danger from recreational activities.	4, 6, 20, 22	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Proposed new spur roads will be decommissioned after use. Existing unauthorized roads used for the project will be closed and hydrologically stabilized. Road access by recreationists will be reduced post-project.
Road construction may result in increased recreational access and subsequent resource damage: habitat destruction, sedimentation, noise and air pollution.	4	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Proposed new spur roads will be decommissioned after use. Existing unauthorized roads used for the project will be closed and hydrologically stabilized. Road access by recreationists will be reduced post-project.
The LSR is comprised of highly unstable granitic and schist soils subject to high rates of erosion and landslides; where road development and timber harvesting has occurred, sediment production has been accelerated.	1	Significant Issue. Effects of increased sediment on Water Quality are discussed in Chapter 3, Aquatic Resource Section.
If the project will result in the closure of roads, then the EIS should describe the criteria used to select which roads to close, and the goals the project intends to meet by closing these roads.	4	Other concern. The project includes changing the status of six system roads from open to year-round closure and includes decommissioning 22 existing unauthorized roads (refer to Chapter 2). These roads were selected because they will be affected by the project or will be used to implement thinning and fuels treatments. The determination to close or decommission these roads post-project was made based on recommendations in the Beaver Creek Ecosystem Analysis, the Mt. Ashland LSR Assessment and in the Project Specific Roads Analysis Process (RAP 2007 in the Project File). Recommendations for road closures or decommissioning were based on minimizing resource damage, minimizing habitat fragmentation and/or minimizing harassment to wildlife due to the LSR land allocation for the area.
The EIS should also describe how roads	4	Other concern. The proposed action, including road actions, is described in Chapter 2.

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will be closed.		
The EIS should disclose if existing roads will be reconstructed and the current impacts or risks they present to the resources of concern.	4	Other concern. The proposed action, including road actions, is described in Chapter 2. Effects of road actions on resources of concern are described in Chapter 3 and in the Biological Assessments/Evaluations for Wildlife, Fish and Botany.
It would be very helpful to have the Beaver Creek Environmental Assessment (which fulfills the roads analysis requirements) online in order to comment on your proposal.	6	Other concern. The Beaver Creek Ecosystem Analysis is on-line at http://www.fs.fed.us/r5/klamath/publications/pdfs/watershed/beavercreek/index.shtml.
Protect roadless areas, ensuring that management actions do not preclude qualification for future wilderness.	22	Non-Significant Issue. This is outside the scope of the proposal. The project is not within any inventoried roadless areas. Non-inventoried roadless areas were released for multiple use management by the 1984 California Wilderness Act, allocated to various land allocations in the 1995 Forest Plan, and are not scheduled for review until the Forest Plan revision.
Use of Slashbuster Masticator		
We have concerns about the use of the Slashbuster masticator, there is very little information regarding the impacts it has on the forest environment, particularly on herbaceous understory. Use of Slashbuster may result in soil displacement, compaction, altered soil nutrient cycling, soil biota and mychorizal communities.	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Standard and Guidelines were integrated into project design to minimize effects of ground-based equipment on soil productivity. Changes were made between the original proposed action and the current proposed action to ensure consistency with soil Standards and Guidelines. A detailed discussion of the effects on soils can be found in the Soil Report (Laurent 2007a), available in the project files. The Forest has monitored mastication since 2001 (Monitoring Reports available at the Supervisor's Office). Monitoring has shown that 31-75% of the soil surface within masticated areas remains undisturbed. Soil disturbance from equipment tracks is generally considered light due to equipment operating over the masticated material (wood chips). Monitoring has shown that heavy disturbance, in the form of compaction and soil displacement, can vary from 0-12% and averages 3% of the masticated area. This type of disturbance is usually in access trails used by equipment to enter and leave the unit. Occasionally, soil displacement occurs where the equipment makes turns and scalps or pushes soil into a small mound. The disturbed area is generally less than a square meter in size. This is considered moderate displacement and is usually does not affect soil productivity because its size is too small to affect biomass growth. Mastication increases the amount of fine organic materials in contact with the soil. This material can decrease transpiration and

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		surface soil temperatures as well as increase soil moisture. There will be an increase in nutrient cycling from leaching and increased biological activities due to an increase in available fine organic materials. Mastication of nitrogen fixing plants may also release some of the fixed nitrogen in the below ground root nodules. There will be a change in the soil biota to organisms that can digest larger materials. Mychorizal communities will remain. As the plants are cut, their nutrient and water demands decrease, thusly decreasing the root system. There may be a short-term decrease in mychorizal activity, but this will quickly increase as root systems respond to vigorous plant re-growth. Standard and Guidelines were integrated into project design to protect biodiversity and plant species. Surveys were conducted to locate and protect rare plants. The dense stands proposed for treatment have low percent cover and diversity of herbaceous and fungi species. Opening up the stands by thinning and fuels treatment by mastication is likely to result in an increase in herbaceous and fungi species diversity. A discussion of the effects on understory plant species can be found in Chapter 3 and the Botany BA/BE (2007), available in the project files.
Use of Slashbuster may result in spread of noxious weeds.	1	Non-Significant Issue. This issue is covered by regulation. USFS Manual 2080 provides direction for assessing and minimizing the risk of noxious weed spread and pathogens. Project design features have been integrated into the project to minimize spread of weeds. Refer to discussion in Chapter 3, Vegetation Section, and the Noxious Weed Risk Assessment.
Use of Slashbuster may result in impacts to chaparral understory, bunchgrasses, native plants, and the herbaceous understory. How does the FS anticipate the response of species such as manzanita and ceanothus to Slashbuster treatment?	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Standard and Guidelines were incorporated into project design protects biodiversity. Chaparral is not present within the Project Area. The dense stands proposed for treatment are currently low in cover percent and diversity of shrub and herbaceous species. Opening up the stands by thinning and fuels treatment by mastication is likely to result in an increase in shrub and herbaceous species diversity. A discussion of the effects on understory plant species can be found in the Botany Report, available in the project files.
How does the FS choose the sites on which to implement the Slashbuster treatment? Is there currently a prioritization of vegetation density, proximity to the community protection zone, vegetation type, or any other	1	Question and Procedural Concerns. When fuels conditions or stand conditions warrant the use of masticators as a tool to accomplish project objectives (mastication would effectively reduce fuels), the location for use within the Project Area is determined by process of elimination. That is, it is not used in places where unacceptable resource damage may occur. For example: the primary limitation is steepness of the area to be treated. The equipment is not used on slopes greater than 35%. Other considerations are: rockiness (very rocky stands limit equipment operability); size of material to be treated [very large (> 12“diameter) and very young material (live limbs within a few inches at the ground) reduce the equipment’s ability to adequately

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parameters or vectors? What criteria are used to determine location of treatments?		treat the vegetation]; and density of the residual stand (if stocking conditions post-treatment are tight (< 10' apart) it is difficult for equipment to operate in the stand and not damage leave trees).
Slashbuster masticator may impact refugia for many species of neotropical migratory birds.	1	Non-Significant Issue. This issue is conjectural and is not supported by factual evidence. Standard and Guidelines from the Forest Plan have been integrated into project design to protect biodiversity. Masticators have the potential to impact neotropical migratory birds that nest on the ground or in shrubs by removing nesting habitat, however, chaparral (a type of shrub) is not present within the Project Area and the dense stands proposed for treatment are low in percent cover and diversity of other shrubs and herbaceous species. The likelihood of ground nesting migratory birds occurring within mastication stands is low. Seasonal restrictions for activities adjacent to NSO and Goshawk nest sites will limit the use of masticators in the spring and early summer when many migratory birds are nesting. Other areas, such as Siskiyou Mountains salamander habitat and Riparian Reserves, will be buffered from heavy machinery further limiting the use of masticators. Thus, at the scale of the species range, any potential impacts to neotropical migrants from masticators will be negligible. Additionally, mastication will not impact habitat of any federal or state listed species, forest sensitive species, or state sensitive species.
What are the anticipated effects of slashbusting on Siskiyou Mt. salamanders and their habitat?	1	Question. For this project Siskiyou Mountains salamander habitat will be surveyed or buffered from heavy machinery. Thus, no heavy machinery will be used within occupied or unsurveyed Siskiyou Mountains salamander habitat. Masticatiors will have no effect on Siskiyou Mountains salamanders (refer to the Wildlife BA/BE).
DFPZs/Fuelbreaks		
How does the Forest propose to ensure funding for the required and routine maintenance necessary to maintain fuelbreaks? Land managers must maintain fuelbreaks or they are useless, or even counter productive.	1, 21, 22	Question and procedural concerns. Future maintenance of fuel breaks or DFPZs is not part of the proposed action; the proposed action is time limited. Any future maintenance of DFPZs will be addressed in a separate NEPA document. Funding sources for future projects is outside the scope of this analysis. The DFPZs are a place where surface fuels are reduced to levels that generate low fireline intensity; ladder fuels are reduced to limit potential for spread into crowns; and canopy fuels are reduced to limit potential spread between crowns and to maintain an overstory of large healthy trees. The time effectiveness of DFPZs depends largely on when fire returns to the areas treated. Historic fire return intervals in the DFPZs varies from 12 years in pine to 30 years in true fir. Thus, treatments will generally be effective for 12 years at lower elevations and up to 30 years at higher elevations. To achieve long-term success requires a monitoring program (such as FIREMON) to monitor changes over time. Monitoring is proposed for this project. If monitoring reveals that treatments are no longer effective, then principles of adaptive management can be applied to develop another treatment. Based on this strategy of monitoring and adaptive management, it is reasonable to assume long-term success.

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Has the Forest conducted geological field investigations in the Project Area to determine if fuelbreaks are proposed on unstable areas?	1	Question, Procedural concern. Geological field reconnaissance for the project was conducted in 2005 and 2006. DFPZs are not proposed on geologically unstable areas (de la Fuente 2007).
Linear fuelbreaks in the Mt. Ashland LSR will be both unsafe and ineffective for the intended function: fire containment during severe fire weather conditions.	1, 2, 3, 5, 7	Non-significant issue. This issue is conjectural and not supported by factual evidence. Linear fuel breaks are not proposed in this project. DFPZs are proposed as areas where surface, ladder and canopy fuels are treated in a manner that minimizes fireline intensity and reduces the potential for passive and active crown fire within the DFPZ. The prescription is designed to mimic historical conditions of open-grown, fire resistant stands. DFPZs have been shown to be effective when designed within the context of the landscape within which they are placed. The DFPZs also provide options for managing entire landscapes including use as anchor points for prescribed fire or wildland fire use (refer to Mt. Ashland LSR Project Fire and Fuels Assessment 2007).
Fuelbreaks are designed for fire suppression actions. Accordingly, the environmental impacts of firefighting in fuelbreaks must be specifically analyzed and explicitly disclosed.	1, 21	Procedural concern. In order to meet the project objective of reducing the threat of wildlife fire, the proposed action includes DFPZs where thinning and fuels reduction will occur. DFPZs are one part of the overall strategy to influence fire behavior in the event of a wildland fire by modifying stand attributes (fuels). The treatment prescription for DFPZs is to mimic historic forest conditions (create open stands), create stands where a crown fire would drop to the ground (Mt. Ashland LSRA), create a condition where fire suppression crews can work safely and effectively, and where fires can be started intentionally (prescribed underburning) to reduce surface and ladder fuels. Using fire crews to underburn or handpile/burn in DFPZs is part of the proposed action and is addressed in the Fire and Fuels Report (Wright 2007) and in Chapter 3. The effects of fire suppression are not the same as implementing prescribed fire. The effects of fire suppression in the event of a wildland fire are outside the scope of the EIS.
Canopy and habitat removal associated with fuelbreak construction will not contribute to the stated PandN.	1	Non-significant Issue. This issue is conjectural and not based on scientific evidence. Thinning and fuels reduction in DFPZs was designed to meet the purpose and need by reducing the threat of catastrophic (stand-replacing) wildland fire. More specifically, prescriptions in DFPZs are designed to create conditions more typical of the historic fire regime by removing shade-tolerant understory, maintaining fire-resistant tree species, and reducing tree density. The expectation that the proposed prescriptions will meet the PandN is based on silvicultural and fuels reduction principles, observations of end results, on-the-ground review, and success with similar projects (refer to the Silviculture Report[Varak 2007], and Fire and Fuels Assessment [Wright 2007]).
Fuelbreak construction will result in degradation of late-successional habitat for NSOs	5, 22	Non-Significant Issue. This issue has been decided by law and regulation. Although DFPZs have the potential to degrade NSO habitat by removing or reducing habitat components used for roosting, foraging, or dispersal, activities have been designed for consistency with the ESA and the Forest Plan. Standard and

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		Guidelines and project conservation measures have been integrated to minimize effects to NSOs and the project is not likely to adversely affect NSOs. DFPZs are proposed along prominent ridgetops: areas that are historically more open and generally provide only limited NSO habitat. For this project, DFPZs are proposed in less than 100 acres of NSO foraging or dispersal habitat. Silvicultural prescriptions will be designed to thin stands at variable densities and keep 15% of the stand unthinned; large trees, large logs and large snags will be retained to the extent possible. This will provide the opportunity to retain the components of NSO habitat. Thus, impacts to NSOs are expected to be minimal.
Opening up the canopy in fuelbreaks or DFPZs can result in growth of flashy fuels, increased solar radiation and wind penetration, raised fuel temperatures, lower fuel moisture, increased fireline intensity and rate of surface fire spread.	1, 5, 16, 20, 21	Non-Significant Issue. This statement is conjectural and not supported by factual evidence. Although opening of the canopy from construction of DFPZs may result in some growth of herbaceous vegetation due to increased sunlight, the prescriptions for project DFPZs have been designed to reduce surface fuels to levels that generate low fireline intensity; ladder fuels are reduced to limit potential for spread into crowns; canopy fuels are reduced to limit potential spread between crowns and to maintain an overstory of large healthy trees. Projected changes in fire behavior within DFPZs are addressed in the Fire and Fuels Assessment (Wright 2007) and in Chapter 3.
Removing old-growth trees has been shown to increase the risk of devastating wildfires. Presence of these larger trees results in cooler burning fires, while at the same time creates a canopy that lessons the growth of easily burning brush.	1,10, 16	Comment. The Project Area has been logged in the past. No old growth stands have been identified in the Project Area but small patches of remnant late-successional forest have been identified. The project has been designed to protect existing patches and promote the development of late-successional forest habitat over the long-term.
Fuel breaks will further fragment this area and bring canopy closure down to 40%, and destroy connectivity in the Project Area.	5	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. DFPZ prescriptions are designed to mimic historical conditions of open-grown, fire resistant stands on ridges. Although stands will be thinned to an average canopy closure of 40% (30-60% depending on aspect), stands will be thinned with variable density and 15% of each stand will be left unthinned. Treatments are designed to be consistent with the capability of the area and it is expected that connectivity will not be significantly affected in the short-term. Over time, thinning and fuel reduction treatments are expected to enhance the connectivity and late-successional and old-growth ecosystem function (refer to Wildlife BA/BE [USDA Forest Service 2007f]). Within the DFPZs, silvicultural prescriptions will be designed to thin ridgetop stands to an average of 40% canopy and 40-60% canopy on adjacent slopes depending on aspect.
Shaded fuelbreaks	7	Non-Significant Issue. This issue is conjectural and not supported

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accelerate mortality of remaining stand due to excess drying.		by factual evidence. The project proposes Defensible Fuel Profile Zones not linear fuelbreaks. DFPZs are designed to maintain 30-50% crown closure with approximately 15% of each stand left unthinned. Prescriptions are designed to mimic historic conditions of open-grown, fire resistant stands on ridges. Density reduction does not increase mortality in residual stands. More nutrients and soil moisture are available to the trees that have been retained. Growth, insect resilience and enhanced vigor are resultant benefits to the retained trees (Smith 1962; Varak 2007).
Shaded fuelbreaks are a breeding ground for noxious weed invasion.	7	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. The project proposes DFPZs as described in Chapter 1. The Project Area was surveyed for noxious weeds and there are no know populations within or adjacent to the area. USFS Manual 2080 provides direction for assessing and minimizing the risk of noxious weed spread and pathogens. Resource protection measures have been included in the proposed action to minimize introduction of noxious weeds from outside of the area. Addressed in Chapter 3, Vegetation Section and the Noxious Weed Risk Assessment (USDA Forest Service 2007d) in the project file.
Fuels reduction within fuelbreaks/ flanks benefits only those sites, while existing hazardous fuel loads outside of fuelbreaks/flanks remain untreated and susceptible to severe fire effects during extreme weather conditions.	1	Non-Significant Issue. This is conjectural and not supported by factual evidence. The Proposal includes fuels reduction in DFPZs (1286 acres) and fuels treatments on an additional 3420 acres outside of DFPZs within 2 subwatersheds. Treatments will reduce the potential for stand replacing wildfire as measured by reduced flame length, crown fire potential and BA mortality, within that entire area. DFPZs are strategically placed landscape treatments designed to minimize the spread of wildfire across the landscape; they are designed as areas where a canopy fire would drop to the ground and reduce fire spread or provide areas for suppression crews to work.
Given that absolute fire prevention or exclusion across the landscape is neither possible nor desirable, the underlying objectives for fuelbreaks need to be reconceptualized and expanded beyond suppression alone to support fire reintroduction and ecosystem restoration objectives.	1	Non-Significant Issue. This is outside the scope of the analysis. The objectives of the project are to reduce the threat of catastrophic wildfire, by reducing fuels and developing DFPZs, and to restore and maintain late-successional forest habitat through density reduction. Fire exclusion and fire prevention are not objectives of the project. Current Forest management direction calls for the suppression of wildland fires based on the appropriate suppression response (Forest Plan 22-2), the Forest Service's use of fire suppression tactics on wildland fires is outside the scope of this project. Fire reintroduction is not an objective of the project. Underburning will be used as a tool to reduce fuels but, in the event of a wildfire, the appropriate suppression response will still be used. DFPZs are strategically placed to minimize the spread of wildfire across the landscape. The objectives of DFPZs are to be places where surface fuels are reduced to levels that generate low fireline intensity; ladder fuels are reduced to limit potential for spread into crowns; and canopy fuels are reduced to limit potential spread between crowns and to maintain an overstory of large healthy trees (refer to Fire/Fuels Section of Chapter 3).
If firefighters enter fuel breaks exhibiting such conditions	21	Non-Significant Issue. When compared to present conditions, even if not maintained over time, DFPZs will not have worse ground fuel and vegetation structural characteristics, such as height to live

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(overgrown fuelbreaks) in the absence of stand maintenance, they are likely to face hotter, drier, and windier conditions more conducive to extreme fire behavior and resistant to control efforts compared to the pre-fuel break condition.		crown, canopy bulk density and snags that typically pose threats to firefighters. Fire behavior is fully evaluated before sending firefighters into potentially dangerous situations. Firefighter safety is the highest priority for wildland fire suppression. Refer to Comment 56 for a discussion about DFPZ maintenance.
Prioritize treating high risk areas starting in the community zone with highest gain in protecting homes and communities.	22	Other concern. Prioritization of projects. This has already been decided by higher level planning efforts. The Forest Fuels Program places emphasis for project development on Wildland Urban Interface (WUI) (community) Zones. The Mt. Ashland LSR Project is part of the Forest Wildlife Program where the emphasis is on habitat restoration and protection. This is a cooperative wildlife project with the USFWS that is consistent with HFRA and proposes to provide enhanced protection from catastrophic wildfire for threatened species and their habitat.
Reducing Fuels/Fire Behavior		
Surface and ladder fuels treatments are effective without canopy bulk density reduction.	21	Other concern. The most effective strategy for reducing crown fire occurrence and fire severity is to (1) reduce surface fuels, (2) increase height to live crown; (3) reduce canopy bulk density; and (4) reduce continuity of the forest canopy. In addition to reducing canopy, the thinning prescription also reduces inter-tree competition and recruitment of surface fuels as trees die and fall to the ground. With the Mt. Ashland Project, the Forest proposes to reduce surface fuels, ladder fuels, and density of trees. In order to meet the Purpose and Need and the objectives of the project, large trees (>20 inches DBH) will be retained to the extent possible.
Researchers learned that structurally diverse mature forest with closed canopies overwhelmingly experienced low and moderate severity fire effects when they studied the 1987 Klamath fire complex.	1, 21	Other concern. Topography also has a strong influence on fire severity patterns. Fire history studies in the Klamath Mountains have shown that both aspect and slope position influence fire severity. Study results suggest that forests with late-successional characteristics (e.g., multi-layered canopy, high density of large diameter trees, snags and coarse woody debris) were more commonly found at the lower slope positions as well as north and east facing slopes. Upper slope positions and intermediate slope positions on south and west facing slopes were more likely to display a pattern of scattered, remnant older trees within a larger pattern of younger stands. The project design and prescriptions being applied are consistent with fire history studies regarding fire severity and stand composition and structure at the landscape scale (refer to the Fire and Fuels Report in the Project File). In addition, old-growth and late-successional forest stands were not proposed for treatment with this project.
The usefulness of thinning as a tool to reduce fire behavior	1	Non-Significant Issue. This is conjectural and not supported by scientific evidence. The proposed action includes treatment of surface fuels, ladder fuels and canopy fuels as needed to moderate

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is controversial and experimental. Tree thinning and biomass removal alone are unlikely to effectively reduce fire severity in dense stands.		fire behavior. A considerable body of research and personal experience exists demonstrating that thinning and fuels reduction affect fire behavior and lead to reduced fire risk. Refer to Chapter 3, Fire and Fuels Section. The use of forest thinning combined with fuels treatment is widely accepted as a tool to bring important contributors of fire spread and intensity (height to live crown, canopy bulk density) to levels that are less likely to produce catastrophic stand replacing fires (Skinner et al. 2004; Graham et al. 2004).
Thinning (proposed density management) may result in opening the forest canopy and allowing solar radiation and wind to reach the forest floor thus reducing moisture and increasing the flammability of surface fuels.	1, 20, 21, 22	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. A considerable body of research and personal experience exists demonstrating that the proposed actions lead to reduced fire risk. Thinning treatments are designed to maintain 30-60% crown closure (depending on aspect and slope position) with approximately 15% of each stand left unthinned. Prescriptions are designed to mimic historic conditions of open-grown, fire resistant stands on ridges and more dense stands lower on slopes. Density reduction will result in more nutrients and soil moisture available to the trees that have been retained. Growth, insect resilience and enhanced vigor are resultant benefits to the retained trees. (Smith 1962; Varak 2007). Proposed fuels treatments in thinned stands will reduce surface and ladder fuels. Refer to Chapter 3, Fire and Fuels Sections.
Thinning (proposed density management) may result in increasing the flammability of surface fuels thus reducing the effectiveness of direct attack fire suppression tactics.	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. A considerable body of research and personal experience exists demonstrating that the proposed actions lead to improved fire fighter safety and suppression effectiveness. Refer to Chapter 3, Fire and Fuels Section. See comment above (74) regarding flammability.
Mechanical thinning generates large quantities of slash from the canopy to the ground (fine fuels) and may result in increased rate of fire spread and fireline intensity.	1, 21, 22	Non-Significant Issue. This is conjectural and not supported by factual evidence. Thinning treatments will result in a short-term increase in fuels after treatment and before fuels treatments are completed due to the lag-time between accomplishing the two treatments. However, the proposed action includes treatment of surface fuels and ladder fuels through handpiling, masticating, and underburning. Treatment of fuels after thinning will result in reduced rate of spread and fireline intensity when compared to no action. A considerable body of research and personal experience exists demonstrating that thinning followed by fuels treatments will lead to reduced fire behavior (Skinner et al. 2004). Refer to Chapter 3, Fire and Fuels Section.
Removing trees greater than 12” and leaving trees less than 12” is worse than doing nothing at all.	22	Other concern. Alternatives 2, 4 and 5 propose removing trees both greater than and less than 12 inches. The No Action alternative proposes to do nothing at all. Comparison of alternatives can be found in Chapter 3.
Given the topography of the	21	Other concern. Topographic variables of slope position, percent slope and aspect are primary drivers of fire spread and intensity.

Scoping Comment	Commenter or letter number:	Disposition
analysis area and its unique receipt of weather during fire season, fuels treatment units should be distributed with spatial patterns of fire spread in mind.		Along with vegetation conditions (i.e., density, height to live crowns and canopy bulk density) and fuels, these are important design elements for locating and prescribing treatments for DFPZs. All these elements have been used in the Mt. Ashland project to design DFPZs. Sixty percent of the DFPZ acres are in the upper one-third slope position where extreme fire behavior is most likely. Density of fire starts from lightning, based on a fire starts database that goes back to 1906, shows that the greatest potential for lightning starts is in the southwest portions of the Project Area. The landscape positions of the DFPZs addresses this potential threat by concentrating treatment units in the southwest part of the Project Area and strategic ridges to the north. Fire spread in this landscape is largely determined by the preponderance of steep slopes. Research has shown that slopes >20% experience more extreme fire behavior (Lentile et al. 2006). Ridge tops and associated shoulders (upper one-third slope positions) offer the best chance of modifying fire behavior through DFPZs.
The in-growth must be treated in order to retain the fuel reduction benefits of the original thinning; or doing the thinning in the first place is worse than doing nothing at all.	22	Other concern. Alternatives 2, 4 and 5 propose thinning and fuels treatments. The benefits of those treatments and how well they meet the Purpose and Need are displayed in Chapter 3. Based on modeling used for the analysis, benefits of thinning and fuels reduction are expected to last more than 40 years. The No Action alternative proposes to do nothing at all. Comparison of alternatives can be found in Chapter 3 (refer to the Fire and Fuels Section and the Vegetation Section).
Thinning/Silvicultural treatment		
Mechanical thinning can adversely affect the environment by removing large resistant trees and increasing mortality of residual trees from mechanical damage.	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Standards and guidelines were integrated into project design to minimize damage to residual stands during logging. The proposed action includes retaining large fire- and insect- resistant trees. Some damage to residual trees is expected to occur as a result of mechanical harvest but will be minimized by project design. The prescriptions will retain the larger trees within any given stand. Trees to be removed will be the smaller, diseased and or weakened trees in the stands. Contractual clauses and requirements along with on the ground inspection during project implementation will reduce the number of trees that may get damaged.
Mechanical thinning can adversely affect soils integrity through increased erosion, compaction and loss of litter.	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Refer to the Response to Comment 50. Monitoring since 2001 has shown that high levels of soil cover remain after mastication. The unit average post-mastication soil cover ranges from 87-99% and averages 95%. Masticated cover is highly effective in preventing erosion compared to less dense soil cover under brush vegetation. Monitoring has shown that 31-75% of the soil surface within masticated areas remain undisturbed. Soil compaction from equipment tracks is generally considered slightly increased due to equipment making one pass over an area and because the equipment operates over the masticated material. More heavily compacted areas can occur in access trails used repeatedly by

Scoping Comment	Commenter or letter number:	Disposition
		equipment entering and leaving the masticated areas. Areas that may experience heavy compaction are limited in extent, usually less than 5% of the masticated area. Brush fields usually have low amounts of litter because this material decomposes quickly. Mastication will actually increase the extent and thickness of the litter layer.
Mechanical thinning can adversely affect fish from sediment pulses in streams.	1	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. No mechanical thinning is proposed within Riparian Reserves, although it is possible that a minimal amount of skidding will occur there. Project design features and Standards and Guidelines will minimize soil displacement. Sediment is unlikely to reach streams due to the filtering capacity of Riparian Reserves. Effects to aquatic resources are considered to be negligible (Chapter 3, Aquatic Resources Section). The Fisheries Biological Assessment (B. Thomas 2007b) has been prepared for this project. The BA concluded that there will be no adverse effects to fish.
Thinning can increase fire hazard if logging residue and thinning slash are not adequately treated.	21, 22	Comment. Treatment of logging slash is proposed for all thinning activities. Refer to Chapter 3, Fire and Fuels Section, for a discussion of fire risk both before and after fuels treatments have been completed.
Mechanical thinning can result in insufficient densities of large trees and woody debris to sustain viable populations of cavity nesting and woody debris species.	1	Non-Significant Issue. This issue is conjectural and is not supported by factual evidence. Standards and guidelines permit removal of large trees when it is consistent with management objectives. Snags, large tree and coarse woody debris standards from the Forest Plan call for retention of those features on the landscape and are included in the project design. In order to meet project objectives, trees >20 inches DBH will be retained to the extent possible. Implementation of Forest SandGs along with retention of trees >20 inches, will result in maintenance of habitat and a determination of “no effect” on species viability. Refer to Chapter 3, Vegetation and Wildlife Sections and the MIS Report (Johnson and Thomas 2006).
Mechanical thinning can reduce cool, moist microclimate resulting in reduced habitat quality for sensitive species.	1, 4, 7	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Although thinning may reduce habitat components in some areas, the project has been designed to meet the objectives of promoting development of late-successional forest and maintaining late-successional forest where it currently exists. Standards and Guidelines have been integrated into project design and include measures to minimize effects on Sensitive species. Thinning may have short-term effects on habitat in order to achieve beneficial effects and improve habitat quality long-term. Treatments would result in a long-term improvement of forested stand condition with an increased resilience to catastrophic wildfire. Opening the canopy will encourage the continuing crown development and radial growth of the residual trees. Canopy cover will increase with the development of larger crown diameters which will ameliorate any short term increase of forest floor temperatures after thinning. Areas of existing suitable late-successional forest habitat will not be degraded during the project. Effects of project activities on wildlife and fish are addressed in Chapter 3; resource protection measures

Scoping Comment	Commenter or letter number:	Disposition
		are incorporated to minimize impacts to both wildlife and fish.
Mechanical thinning can open forest canopies and eliminate multi-layered internal forest structure and is not compatible with conservation of NSOs, NSO Critical Habitat, Pacific fisher, pileated woodpecker, and northern goshawk.	1	Non-Significant Issue. This issue has been decided by law and the Forest Plan. Project activities are consistent with the ESA, the Forest Plan, and the Recovery Plan for the Northern Spotted Owl (USDI Fish and Wildlife Service 1992b). Mechanical thinning is an appropriate tool for use in achieving management objectives within LSRs and NSO habitat (Forest Plan, pp. 4-104; Draft Recovery Plan, Appendix F). Standards and Guidelines from the Forest Plan have been integrated into project design and include measures to minimize effects on Sensitive species during implementation of thinning treatments. The proposed project is designed to restore and maintain habitat for late-successional forest related species; treatments would result in a long-term improvement of forested stand condition with an increased resilience to catastrophic wildfire Currently, the area consists of dense stands of sapling to pole sized stems that provide minimal habitat for species listed above and are not likely to become habitat in the near future. “Variable density thinnings will be the most appropriate general approach” to accelerating development of old growth conditions in a stand. “These will incorporate “skips” (areas with no thinning) and gaps (areas that are heavily thinned) along with a dominant stand matrix that receives intermediate treatments” (Franklin et al. 2000). Effects of project activities on wildlife are addressed in Chapter 3, and in the Wildlife BA/BE (USDA Forest Service 2007m).
The HFRA prohibits removal of old growth forest structure.	1	Procedural concern. The Project Area has been logged in the past. No old growth stands have been identified in the Project Area but small patches of remnant late-successional forest have been identified. The project has been designed to protect existing patches and promote the development of late-successional forest habitat over the long-term. It is consistent with the HFRA Section 102 (e) which calls for maintaining, or contributing toward the restoration of, the structure and composition of old growth stands; and (f) which calls for maximizing the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands. The project is in accordance with Section 102, Part (f)(1)(A) which requires projects that focuses largely on small diameter trees, thinning, strategic fuel breaks, and prescribed fire to modify fire behavior, as measured by the projected reduction of uncharacteristically severe wildfire effects for the forest type.
Any action in late–successional habitat must be justified with demonstrated benefits to such habitat in order to comply with the NFP; professional opinion is an inadequate justification.	1	Procedural concern. The Proposed Project is designed to restore and maintain late-successional habitat within the Project Area. The benefits to stand growth through density management are well documented (Oliver and Larsen 1990; Main and Amaranthus 1996). These benefits are additionally advantageous by providing fire resiliency to treated stands (Graham et al. 2004). The benefits of the treatments, and how well they meet the Purpose and Need, are discussed in Chapters 2 and 3.
All existing suitable habitat may be critical for survival of NSOs due to added	22	Other concern. The amount of habitat that is needed for NSO recovery is outside the scope of this proposal. A NSO recovery team has been convened to address these types of issues with no results yet. The quantity and quality of habitat are important factors

Scoping Comment	Commenter or letter number:	Disposition
threats from: barred owl, West Nile virus, Sudden Oak Death, wildfire, climate change, misapplication of HFI, and all habitat is needed for recovery.		relative to the survival of NSOs. However, scientific evidence does not support the claim that existing levels of suitable habitat will (or will not) be necessary to safeguard NSOs to existing and potential threats. This project is consistent with the ESA. The project is designed to promote growth of late-successional forest used by NSOs.
That commercial logging can reduce the incidence of canopy fire was untested in the scientific literature; it does not address crown base height (the branches, seedlings, and saplings which make up the ladder fuels).	22	Non-Significant Issue. This is conjectural and not supported by scientific evidence. Although consensus has not been reached regarding the potential for fuels treatments to create more sustainable and resilient forest structures, there is sufficient literature to justify such treatments, followed with monitoring and principles of adaptive management. Forest stands treated with tree density reduction and/or prescribed underburns have shown less severe canopy and ground char damage (Cram et al. 2003; Raymond and Peterson 2005; Lentile et al. 2006; Skinner et al. 2004).
Prescribed fire		
Physical and chemical components released by burning may impact soil and water quality and may exceed standards for air and water quality.	4	Non-Significant Issue. This issue is already decided by regulation. Prescribed burning must comply with National and State Ambient Air Quality Standards. Burn plans that call for compliance with Burn Day, Marginal Burn Day and No Burn day designation, and coordination with and permitting from the local air pollution control district, will minimize cumulative effects from smoke (refer to the Project Air Quality Report, [Snavely 2007b]). Burning of organic materials would result in a minor loss of nitrogen but this will have no measurable effect on soil productivity. Heat penetration into the surface soil during burning will be minimal to none. Generally, soil pH, P, and exchangeable K, Ca, and Mg leach into the soil soon after fire (Wells et al. 1979). The overall forest floor would be adequately maintained by underburning and pile burning. Recent soil cover monitoring of underburns on the KNF has shown that post-burn soil cover easily exceeds cover requirements (Laurent 2006a). Also, some of the seedbed in isolated spots may be disturbed and cause less vegetative growth over the short term. Erosion will be minimal to none because this low intensity burn will retain sufficient cover to protect the soil (Laurent 2006a).
Prescribed fire is an effective treatment for reducing fire behavior and is a viable fuels treatment option on all terrain. Construction of DFPZs is not required to initiate prescribed burning, existing roads provide appropriate fuel breaks.	1, 22, 25	Other concern. Underburning is proposed as a treatment on 1,528 acres and handpiling/underburning is proposed on 959 acres. Although construction of DFPZs is not required to initiate prescribed fire, it will meet the purposed and need and was proposed for this project. Use of prescribed fire without mechanical treatments can be effective in reducing surface fuels and raising canopy base heights. It is generally less effective at reducing canopy bulk density, as fires intense enough to kill larger trees often exceed desired fire severity thresholds. Additionally, while prescribed fires initially consume biomass, they also create fuels by killing understory trees, so that surface fuel biomass may return to, or exceed pre-burn levels within a decade.

Scoping Comment	Commenter or letter number:	Disposition
Prescribed burning costs significantly less than other fuel reduction treatments.		
Wet season burning can negatively affect plants and microorganisms due to more efficient heat conductivity deeper into soil layers than would occur in the dry season.	1, 4, 21	Comment. This is conjectural and not supported by scientific evidence. Proposed underburning may occur in both the dry and the wet season. The Project Area has low understory plant species diversity (Knorr pers. comm.). There would be a short-term reduction in plant cover following spring burning, followed by a long-term increase. A detailed discussion of the effects on understory plant species can be found in the Botany Report, available in the project files. Recent research on soil heating during burning of masticated forest residues came to an opposite conclusion. Moist soils resulted in a dampening effect on heat penetration. Studies have shown that most understory species are not significantly affected by burn season (Knapp et al. 2007; Sparks et al. 1998) Other studies have shown that wet season burning has the least affect on surface and below ground organisms (Busse et al. 2006).
Prescribed fire in areas with high fuel loading due to fire exclusion can pose a high risk of escape.	1	Non-Significant Issue. This was decided by the Forest Plan and other higher level policy. USFS policy requires site specific burn plans to be developed based upon complexity analysis which evaluates the risk, potential consequences, and technical difficulty for fourteen elements, including projected fire behavior and potential for escape. Use of this planning process to minimize risk of escape in areas with high fuel loading has proven successful on the Klamath (Kolu pers. comm.).
Manual fuels treatments can effectively clear flammable fine fuels and prepare a site for burning without significantly impacting soils or wildlife habitat.	1, 21	Other concern. The project design includes stands with manual treatment, where appropriate, based on site specific conditions.
Prescribed fire may require many sequential entries before desired conditions are realized.	1	Procedural concern. The project design includes manual and mechanical treatments as well as prescribed fire, where appropriate, based on site specific conditions. The use of manual and mechanical treatments will reduce the number of entries required to achieve the desired conditions, and will achieve the desired stand conditions more readily than use of prescribed fire alone. Underburning is proposed as described in Chapters 1 and 2. Additional underburning or prescribed fire is not part of the proposed action; the proposed action is time limited. Any future burning will be addressed in a separate NEPA document. Funding sources for future projects is outside the scope of this analysis. Monitoring is proposed for this project. If monitoring reveals that treatments are no longer effective and that additional burning is warranted, then another treatment can be planned.
Wet season burning may impact non-sprouting shrubs,	21	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. Non-sprouting shrubs represent a small percentage of the shrub taxa in the Project Area. Most shrubs in

Scoping Comment	Commenter or letter number:	Disposition
resulting in poor regeneration, and reduced populations. Areas of poor shrub regeneration will be prone to weed and grass invasion. Fine fuels may result in re-burn, and frequent fire, reducing slope stability.		the Klamath Mountains sprout from basal burls or underground root structures following fire. In absence of such fire adaptations, seed banks are typical mechanism of plants to respond to fire. There will be a short-term reduction in species cover following spring burning, followed by a long-term increase. Reburns in themselves are not necessarily a negative impact; indeed most of the vegetation communities in the Project Area have a fire return interval of 12-17 years at lower elevations and 30-35 years at the higher elevations. The Project Area is moderately to severely departed from historic fire return intervals. Grass often increases with increased fire frequency, but if ladder fuels (small diameter conifers) are at low levels, then high intensity stand replacing fires are less likely to occur. The contribution of vegetation to slope stability is related to rooting depth and root size. Trees contribute the most to slope stability. A discussion of the effects on understory plant species can be found in the Botany Report, available in the project files. USFS Manual 2080 provides direction for assessing and minimizing the risk of noxious weed spread and pathogens. Resource protection measures have been included in the proposed action to minimize spread of noxious weeds. Refer to Chapter 3, Vegetation Section and the Noxious Weed Risk Assessment in the project file.
Use of prescribed burning can result in depletion of multi-layered forest structure and can degrade habitat for species like NSO and goshawk; prescribed burning therefore should not be implemented in sensitive habitats over wide areas in the same vicinity over a single decade. Large older trees should be protected.	1, 4	Non-Significant Issue. This issue is conjectural and not supported by scientific evidence. Prescribed burning consists of low intensity fire applied by trained experts to clear the ground of built up dead wood, brush and, in some cases, small trees. Prescribe burning is done within prescription and according to a burn plan and is designed to maintain soil cover and retain large trees. Standing forest structure, especially large trees, will not be impacted by low intensity prescribed fire. Habitat for late-successional forest related species like NSO and goshawk will be maintained. To ensure the distribution of potential NSO prey (species associated with dead wood) will not be significantly impacted by fuel reduction treatments, Project conservation measures limit the amount of NSO habitat that can be included within proposed underburn perimeters annually to <35% of the suitable habitat within a NSO core area and <25% of the suitable habitat within a home range. Additionally, low intensity underburns typically burn in a mosaic pattern leaving patches of unburned habitat as refugia for small mammals.
Periodic monitoring should follow burning treatments to determine whether restoration goals have been met.	1	Procedural concern. Agency policy provides direction to address monitoring requirements during development of a burn plan. Fire monitoring will be implemented as described in Chapter 2.
Prioritize restoring fire adapted ecosystems that have evolved with frequent fire (0-35 years), including Ponderosa pine and	22	Other Concern. Prioritization of restoration projects related to fire adapted ecosystems is outside the scope of this analysis. The Mt. Ashland LSR Project is part of the Forest Wildlife Program where the emphasis is on habitat restoration and protection. This is a cooperative wildlife project with the USFWS that is consistent with HFRA and proposes to provide enhanced protection from catastrophic wildfire for threatened species and their habitat.

Scoping Comment	Commenter or letter number:	Disposition
other forests dominated by long needled species, and prairies, chaparral, and sagebrush ecosystems (known as “fire regimes I and II).		
Cumulative effects		
Significant cumulative impacts from past management activities (logging and road building) and proposed activities (ski run expansion and Ashland Forest Resiliency Project) are impacting the ability of this LSR to provide much needed interior late-successional habitat.	1, 25	Non-Significant Issue. This issue is conjectural and not supported by factual evidence. The effects of the proposed action, combined with effects of past logging and road building, the ski run expansion and Ashland Forest Resiliency Project, are considered in the cumulative effects section of the Wildlife BA/BE (USDA Forest Service 2007m) and in Chapter 3. Although past logging and road building have removed interior late-successional forest habitat within the Project Area, the majority of logging occurred prior to designation of the LSR. The Project Area currently does not have large blocks of interior late-successional forest habitat, therefore the project will not have negative effects on the ability of the LSR to provide interior late-successional habitat. The Proposed Project is designed to restore and maintain habitat for late-successional forest related species over time; the Ashland Forest Resiliency Project is designed to protect and enhance late-successional habitat; treatments would result in a long-term improvement of forested stand condition with an increased resilience to catastrophic wildfire and eventually provide for larger blocks of contiguous habitat.
102) There are at least 6 current THP’s on private lands within this watershed.	5	Other Concern. Contact with Oregon Department of Forestry and the CDF identified five “current” THPs and 3 past THPs in the vicinity of the proposed project (2 5th-field watersheds). These activities were considered in the cumulative effects analyses in Chapter 3.

Appendix H Response to Comments

SUMMARY OF PUBLIC COMMENTS
DRAFT EIS MT. ASHLAND LATE-SUCCESSIONAL RESERVE HABITAT RESTORATION AND FUELS MANAGEMENT PROJECT

Prepared for

Klamath National Forest

March 2008

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INTRODUCTION

This report summarizes public comments on the *Draft Environmental Impact Statement for the Mt. Ashland Late-Successional Reserve Habitat Restoration and Fuels Management Project* (DEIS).

The DEIS was released for public review and comment on June 15, 2007. Comments were to be received through July 30, 2007. Comments were received from 143 individuals, organizations, and interest groups. Written comments arrived in seven mailed letters, seven email letters (one of which was signed by eight environmental interest groups), and one form letter sent in by 122 individuals.

This analysis of pubic comments describes what people have said as completely and directly as possible without assigning weights or including every single word that was submitted. The system used to analyze comments is objective, reliable and traceable. All comments on the DEIS received by the due-date have been considered in the production of this summary.

The Public Comment Analysis Process

The analysis method used for this project provides a means of categorizing each person's comments into separate subjects, then grouping like subjects together so that the public's comments can be more thoroughly examined. It accurately displays public concerns and reasoning about particular issues and alternatives capturing each person's own words and phrases. It provides a traceable, visible system for displaying comments without injecting interpretation or judgment by the analysis team.

Each comment was first given a unique identification number. A coding system was developed to assign demographic information to each respondent and to record their opinions on issues and alternatives. Demographic information included identifying who the respondent represents, the medium used for responding, the respondent's overall preference for or against the proposal, and where the respondent is from. Please refer to Section 10, Explanation of Codes, for further information.

Next, substantive comments related to a particular alternative were coded, along with particular reasons (issues) for support of, or opposition to, an alternative. In many instances a particular alternative was not identified, but issues relating to the analysis or proposal were addressed. Some people asked for modifications to an alternative, suggested additional alternatives, or asked that previous alternatives be reconsidered. These comments were captured as well. All substantive comments, codes, and demographic information were entered into a database for easier sorting and retrieval.

All respondents' values, perceptions, and opinions were captured. The exact words of each respondent were used rather than summaries of the person's words to insure accuracy and objectivity. All letters were read once and coded and then read again by another coder to ensure all issues were highlighted and

entered into the data base. The form letter responses were grouped to insure identical coding was used on each letter. Comments in technical, legal, or complex letters were coded and included in the database and also "red-flagged" because of their length and detail. These letters were be given to the interdisciplinary team and the decision maker for their attention.

Any respondent's substantive comments are included in the database; the original letters and coded copies are filed in the project file. The names and addresses of all respondents are also included in the project file.

The content analysis team consisted of three people from Ecosystem Research Group (ERG), Missoula, Montana. A team leader was sub-contracted by ERG to oversee the content analysis process and report writing.

Demographic Summary of Respondents

Table I-1 Who Responded

Organization Type	Number of Signatures
Attorneys (legal)	0
Individual Citizen	7
Tribal Government	0
Federal	2
State	0
County	0
Professional Scientific Organization	0
Industry Interest (Ranching, Timber, etc.)	3
Environmental Interest	130
Recreation Interest	1
Congressional/Legislative	0
Business	0
Total	143

Table I-2 How People Responded

Response Type	Number of Signatures
Letter or Post Card	7
E-mail correspondence	14
Form Letter	122
Total	143

Table I-3 Where Respondents Are From

Location	Number of Signatures
Unknown	8
Ashland, Oregon	105
Azalea, Oregon	1
Brookings, Oregon	2
Central Point, Oregon	1
Eugene, Oregon	2
Grants Pass, Oregon	2
Jacksonville, Oregon	3
Medford, Oregon	1
Portland, Oregon	1
Talent, Oregon	1
Altadena, California	1
Anderson, California	1
Arcata, California	1
Corte Madera, California	2
Crescent City, California	1
Garberville, California	1
Mt. Shasta, California	1
Orleans, California	1
Rancho Mirage, California	1
Somes Bar, California	1
Weed, California	1
Yreka, California	2
Chicago, Illinois	1
Seattle, Washington	1
TOTAL	143

Form Letters And Group Letters

One form letter and one long technical letter signed by eight groups were received. The concerns raised in those letters are included with other comments in the Alternatives Chapter and Issues Chapter of this report. Following is a summary of the key issues from the form letter.

Form Letter – Klamath Siskiyou Wildlands Center, Ashland, Oregon (122 total): This form letter was generated by the Klamath Siskiyou Wildlands Center and included the following points:

a. "While I support fuels reduction and small diameter thinning in the Mt. Ashland Late-Successional Reserve Habitat Restoration and Fuels Reduction Project, I am very concerned about the road construction associated with the plan."

b. "Beaver Creek is an important tributary to the Klamath River and it already has far too many logging roads. These roads bleed sediment into nearby streams and fragment wildlife habitat. The Beaver Creek Watershed is very prone to erosion."

c. "The Forest Service should reconsider any plans to build new roads in the watershed. Building 7 miles of road as part of this project is unnecessary as the Forest Service has identified other means to accomplish fuels reduction and thinning without building these logging roads."

d. "I am also concerned with plans to log and yard trees through stream-side areas. This can be very harmful to the "riparian reserves." These reserves are set aside to protect the aquatic ecosystem and should be managed with a delicate touch."

Group Letter – Klamath Siskiyou Wildlands Center, et al. (8 groups total): The specific comments are included throughout this report along with other comments received.

The eight groups responsible for this letter included the following statement in their cover letter:

e. "The comments are rather extensive in order to retain legal standing on a wide variety of issues in case the agency elects to ignore public sentiment and select an alternative that calls for extensive logging road construction, ground-based yarding, group selection logging and steep slope mastication in the forthcoming ROD. Our organizations hope to work collaboratively with the Forest Service to implement a project that thins small-diameter white fir and ladder fuels while avoiding further terrestrial and aquatic degradation in the impaired watersheds of this late successional reserve."

1. PROCESS

This section addresses each of the issues identified in the analysis of public comments received on the DEIS. The issues or "concerns" are presented by subject area rather than by the numerical code number listed beside it. There were numerous letters in general support of the proposal, but most had suggestions on how to make the proposed action better. The positive comments are also reflected in this document. The code numbers were assigned during the analysis process as a tool for the content analysis team to categorize comments. The full coding system used for analysis of the comments is in Section of this Appendix.

1.1 DRAFT EIS PROCESS (CODE 100)

One issue with the Draft EIS process is the contention that the Forest Service did not fully consider the cumulative watershed effects. Some respondents are concerned with the reliance on BMPs (Best Management Practices) to meet the substantive requirements of both the Clean Water Act and the Basin Plan. Some are also critical of the lack of surveys for sensitive and management indicator species. Some respondents claim that proper procedures have not been followed for the Draft EIS Process. Other related comments are included in other sections of this report pertaining to specific resources.

Some commented that cumulative watershed effects need to be better analyzed and disclosed.

a. "the Ninth Circuit rejected the cumulative impacts analysis in an EIS because it referred in general terms to 'development projects' and 'ongoing urbanization' rather than identifying these projects and their impacts. Carmel by the Sea v. US Dept. of Transportation...For the Mt. Ashland LSR and AWWC logging project, the Forest Service's failure is even greater. It is not a diffuse 'ongoing urbanization' that is impacting the listed species in the watershed; Rather here we see a series of timber sale projects are being implemented that result in cumulative impacts to a single LSR. NEPA requires disclosure of the cumulative impacts from these timber sales."

   Response: Cumulative effects result from the incremental effects of actions, when added to past, present and reasonably foreseeable future actions. For the Mt. Ashland LSR Restoration and Fuels Reduction Project, methods of cumulative effects assessment varies by resource and they have been considered in the EIS analysis. Past individual timber sales within the LSR have been incorporated into the analysis, they are listed in Appendix B. Their impacts are often, but not always, best considered by incorporating them into baseline conditions (e.g., miles of road in relation to water quality). Present and reasonably foreseeable actions have been incorporated into the analysis (e.g., Ashland Watershed Protection Project and the Ashland Forest Resiliency Project).

Cumulative effects analysis for the LSR incorporated past actions into the LSR baseline and included all reasonably foreseeable future actions within the LSR boundary (Johnson 2007, 2008, FEIS Section 3.2.4). For wildlife species, excluding the NSO and Pacific fisher, cumulative effects analysis included all actions within the Project Area boundary (as described in the FEIS Sections 1.6 and 3.2.6–3.2.28). For the NSO, the cumulative effects analysis area included the Project Area boundary and the area within the estimated 1.3 mile home range of known activity centers when they extended outside of the Project Area. Within this area, all reasonably foreseeable future actions were considered (FEIS Section 3.2.12). For the Pacific fisher, the cumulative effects analysis area included the NSO analysis area (which is equivalent to a 1.5–2 mile buffer around the Project Area) and the northern portion of the LSR (the portion of the LSR north of the Siskiyou Crest). Within this area, all reasonably foreseeable future actions were considered.

There were concerns about other cumulative effects not considered.

b. "Fuelbreaks are clearly and specifically designed for fire suppression actions--this is where firefighting is intended to occur. Accordingly, the environmental impacts of firefighting in fuelbreaks must be specifically analyzed and explicitly disclosed. Such analysis did not occur in the DEIS."

Response: Firefighting is not a proposed action and, thus, is outside the scope of analysis. Defensible fuel profile zones (DFPZs) are the most similar proposed activity to a fuelbreak. A DFPZ, as defined in the DEIS 2-17, is more than a fuelbreak:

> The DFPZs are designed to: (1) reduce the extent of wildland fire severity by limiting the amount of area affected by wildland fire; (2) create areas where fire suppression efforts can be conducted more safely and effectively; (3) break up continuity of fuels over a large landscape; and (4) serve as anchor points for further area-wide fuel treatments such as prescribed burning.

No where is it stated that the sole intended purpose of a DFPZ is to stage fire suppression actions. A major objective of fuel modification within a DFPZ is to reduce fire behavior so that an active crown fire moving into the zone will, at a minimum, become a passive crown fire, and optimally the fire will drop out of the canopy and become a surface fire. DFPZs are designed to effect fire behavior at landscape scales, not stand scales. The effectiveness of fuel prescriptions as outlined is supported in recent research findings from the Cone Fire (Ritchie et al. 2007). The urgent need for developing landscape fuel and fire management strategies for LSRs within the dry provinces of the Northwest Forest Plan (NWFP) has been highlighted in recent literature (Spies et al. 2007). The DFPZ strategy is designed to partially address this need.

Some respondents were unhappy with the reliance on BMPs to meet requirements of CWA and Basin Plan.

c. "The KNF's contention that applying a BMP while conducting a specific forest practice minimizes site specific effects and thus also minimizes cumulative effects is logically flawed. Every BMP is an action and has an effect and hence the more the BMPs are applied the greater the cumulative effect. Only by minimizing the number of actions, i.e., the number of individual applications of BMPs, would cumulative effects by minimized. This is precisely why a cumulative effects assessment is needed –to establish the watershed-specific limits and excesses of BMP applications."

Response: The DEIS does not imply that implementing BMPs lowers cumulative effects. BMPs are measures that minimize erosion stemming from individual actions, thereby minimizing direct and indirect effects, and therefore cumulative effects of the actions. They are not ground disturbing activities in and of themselves, but are analyzed as part of the proposed action. If BMPs were not included in the Proposed Action, impacts of the proposed actions would be higher. Some examples of BMPs used to minimize effects of the project are: limited operating periods, applying buffers, restricting skidding slope, calling for the use of existing skid trails (rather than create new trails), suspended log yarding, etc.

d. "However useful site specific BMPs are in minimizing effects of individual actions, they still do not address the cumulative effects of multiple actions occurring in the watershed which, though individually 'minimized' through application of site-specific BMPs, may still be significant, in their totality, and have undesirable consequences for beneficial uses such as salmon populations and salmon habitat."

Response: The Implementation of BMPs does not raise or lower potential cumulative effects. When the proposed action is analyzed, the effects of BMPs are including in the effects of the proposed action. For example, there is a BMP which limits use of tractors to 35% slope or less; therefore the effects analysis for tractor yarding would analyze use of tractors on slopes 35% or less and would not analyze tractors on steeper ground because that is not proposed (due to application of the BMP). A cumulative effects analysis is then conducted that includes the effects of the proposed action (with BMPs) and the effects of other actions (which may also include BMPs). In the GEO and USLE portion of the Klamath CWE model, BMPs are built into the analytical method to ensure meeting Soil Quality and Soil Productivity guidelines. All past, present, and reasonable foreseeable future actions in the analysis area were considered in the cumulative effects analysis as displayed in Appendix B and in the Project Cumulative Watershed Effects Analysis Specialist Report (Elder 2006) and Addendum (Bousfield et al. 2008).

Potential impacts of the project on riparian reserves and fish habitat are discussed in Section 3.4.3 of the FEIS. Cumulative effects of all actions occurring in the analysis area are analyzed in the Biological Assessment (BA) for fish (B. Thomas 2007b) and in the Fish Specialist Report (B. Thomas 2007a, 2008). The BA indicates that consideration of the factors of proximity, probability and magnitude as presented in the effects section for SONCC coho salmon and its Critical Habitat eliminate the likelihood of significant adverse effects to the Indicators of water temperature, suspended sediment/turbidity, substrate character and embeddedness, change in

peak/base flows, and the remaining Indicators. Any project-caused change in any of these Indicators that might reach a stream course containing SONCC coho salmon CH and anadromous fish habitat would be undetectable when compared to background flows, due to the filtering/buffering capacity of Riparian Reserves and contributions of tributary flows downstream from project activities. The Assessment indicated that the agreed-upon Endangered Species Act determination is that the project "May Affect and is Not Likely to Adversely Affect" coho salmon and coho critical habitat (B. Thomas 2007b, 84).

The Hydrologist Report indicates that the Project Area contains intact, functioning riparian zones, and confirms that "Beneficial uses would be protected due to their distance downstream from the Project Area (Snavely 2007a, 2008b) or because domestic water sources are not hydrologically connected to streams in the Project Area. Riparian Reserves will filter sediment and keep it from reaching stream channels. Riparian buffers of 100' or greater have been documented to prevent adverse affects to salmonid eggs and aquatic insects when harvest activities occurred adjacent to fish-bearing streams (Moring 1982; B. Thomas 2006)

e. "Given the significant cumulative watershed impacts discussed above, our organizations were very surprised to see that the Mt. Ashland DEIS relies solely on implementation of vague and generic Best Management Practices (BMPs) to meet the substantive requirements of both the CWA and the Basin Plan. This concerns us greatly. The USFS should be aware that the National Marine Fisheries Service (NMFS) criticizes the use of Best Management Practices (BMPs) and mitigation as poor surrogates for addressing cumulative watershed effects because BMPs are addressed to individual actions and fail to limit the totality of individual actions within a watershed."

Response: Cumulative watershed effects have been fully addressed in the FEIS Section 3.4.1, 3.4.2, and 3.4.3, and in the Project Cumulative Watershed Effects Analysis Specialist Report (Elder 2006) and Addendum (Bousfield et al. 2008). The implementation of BMPs is a portion of how the Mt. Ashland project complies with the Clean Water Act and the Basin Plan. The role BMPs play in meeting the CWA and State water quality standards has been described by the EPA in a guidance document entitled SAM-32 (1987). This guidance was subsequently incorporated into EPA's Water Quality Standards Handbook (EPA, 1994, Water Quality Standards Handbook, Second Edition, Government Printing Office EPA-823-B-94-005a). That guidance established the policy that BMPs are the primary method for controlling non-point pollution and achieving water quality standards. The Water Quality Standards Handbook has since been revised and the BMP policy is again a stand alone document (SAM-32). In part, it says:

> Once BMPs have been approved by the State, the BMPs become the primary mechanism for meeting water quality standards. Proper installation, operation and maintenance of State approved BMPs are presumed to meet a landowner's or manager's obligation for compliance with applicable water quality standards…Applicable water quality standards along with water quality monitoring should be used to measure the effectiveness of BMPs.

It is important to note that the BMP process is iterative in nature, reflecting the complex nature of non-point pollution control. Site-specific prescriptions are applied to identified problems iteratively, until water quality standards are achieved. By agreement, use of the BMP process constitutes compliance with the CWA even in circumstances where water quality standards are not yet achieved. The BMP Evaluation Program is used by Forests in Region 5 to evaluate implementation and effectiveness of specific BMP prescriptions, and initiate adaptive changes to BMP prescriptions (or general BMPs) based on those results. In this way, BMPs are designed to achieve full compliance with water quality standards over time.

Some pointed out the lack of surveys for sensitive and management indicator species and monitoring requirements.

f. "It appears that sensitive species surveys were only conducted for Goshawks, Northern Spotted Owls (NSO) Siskiyou Mountain Salamanders (SMS) and some species of mollusks. Nowhere in DEIS or project file in general, is there an explanation for why theses surveys cannot be conducted for sensitive and MIS species such as Acorn woodpeckers, Western gray squirrels, White-headed woodpeckers, Vaux's swifts, Downy woodpeckers, Pileated woodpeckers or Black-backed woodpeckers. These "snag associated" MIS species will lose habitat due to proposed logging of snags in logging units, in proposed road locations, in landings, and along haul routes. Population numbers and trends have not been analyzed by the agency. This is particularly troubling given that the DEIS (3-18) anticipates a drastic reduction in snags greater than 16" across the project area in the 50 years following the timber sale."

Response: Landscape level fuel reduction projects such as the Mt. Ashland LSR Habitat Restoration and Fuels Reduction Project are necessary to change fire behavior at a meaningful scale because fuel reduction projects that treat limited acres and small or isolated stands may not be effective in reducing wildfire extent and severity (Graham et al 2004; Agee and Skinner 2005). Surveying for all special management status species in these large scale projects is not required or feasible due to the number of species, large area and variety of habitats to cover, overlapping survey seasons, and specific survey requirements (i.e., multiple visits, timing and environmental conditions, etc.). Therefore, for this project the wildlife survey effort focused on federally listed species, species that require pre-disturbance surveys per the Northwest Forest Plan Survey and Manage program, and species that require pre-project surveys per the Klamath Land and Resource Management Plan.

While the number of individuals and discrete populations of snag associated MIS species in the Project Area is unknown, the North American Breeding Bird Survey (BBS) provides regional trend data for these species. To capture a wide perspective of population trends that could be impacted by the project, information for the California, Oregon, and Fish and Wildlife Service Region 1 (the Pacific Northwest) regions were reviewed. According to the 1996–2006 BBS analysis, the population trends for the snag associated species that have habitat and are expected to occur in the Project Area (red-breasted sapsucker, white-headed woodpecker, Vaux's swift,

pileated woodpecker, black-backed woodpecker, and hairy woodpecker) are variable and dependent upon region (Sauer et al. 2007). Population trends for pileated and white-headed woodpeckers are increasing in all regions while downward trends in all regions are being observed for Vaux's swifts and hairy woodpeckers. Black-backed woodpecker and red-breasted sapsuckers population are increasing in two regions and decreasing in one. According to Sauer et al. (2007), none of the population declines for any species in any region is significant.

Site specific impacts to snag associated species habitat is analyzed in the MIS Project Level Assessment Part II (pp. 21 of 30 through 27 of 30). For all of the snag associated species analyzed, impacts to snag habitat were expected to be insignificant at the project level and therefore will not affect population trends post treatment. Fifty years post-treatment, the number of large diameter snags in treated stands is expected to decline. This anticipated decline is primarily due to an expected increase in stand health following treatment and lack of large diameter recruitment trees within these stands due to past railroad logging. However, the model used to generate the data in Table 3-2 (FEIS Section 3.1.4.2) applied a uniform thinning treatment to the stands and cannot incorporate the variable density thinning prescriptions or wildlife habitat retention areas proposed in this project. These "skips" in the variable density prescription (portions of stands unthinned) and the habitat retention areas are actually expected to increase in the number of snags over the next 50 years. Thus Table 3-2 in the DEIS likely overestimates the reduction of snags within treated stands. Stands to be treated are predominately mid-successional stands that are not providing high quality mature forest habitat; in addition, treated stands represent only 32% of the entire Project Area. Therefore, snag recruitment is expected to continue over the majority of the Project Area. Therefore, while the expected reduction of snags in treated stands may negatively affect individuals, it is not expected to have an impact on population trends.

g. "The following contention in the MIS Assessment (page 1) is flatly incorrect: 'The Monitoring Requirements in Chapter 5 of the Klamath National Forest Land and Resource Management Plan (LRMP) do not require population monitoring or surveys on MIS with the exception of steelhead trout and rainbow trout.' In fact (as recognized by the court in KS Wild v. USFS) the KLRMP (at 5-3) clearly states that '[P]opulation trends of the management indicator species will be monitored and relationships to habitat changes determined.' It simply doesn't get much clearer than that."

Response: The KNF LRMP (USDA Forest Service 1995a) directs us to "Use Species Associations…the most current research information, Wildlife Habitat Capability Models or Wildlife Habitat Relationships Models **to assess landscape and project-level impacts to habitat conditions**" for Management Indicator Species (S and G 8-21, p. 4-39 - emphasis added). For the Mt. Ashland LSR Project, project-level impacts to habitat conditions were assessed and are discussed in detail in the MIS Assessment, Parts I and II and summarized in Sections 3.2.22–3.2.24 of the FEIS. For all of the Snag Association species analyzed, it was determined that site-specific effects of the project may result in the removal of individual large trees or snags but impacts to these components are not expected to be significant (Johnson 2007). Because the

effects are insignificant at the Project scale, there will be no effect on MIS populations or population trends.

h. "The Eastern District Court also recently held that the Klamath National Forest violated the law in the Meteor AWWC timber sale Klamath Siskiyou Wildland Center et. al. v. United States Forest Service, Eastern District Court of California, (2006). The court specifically held that the agency's EIS for logging and road construction in this impaired watershed was illegal due to the Forest Service's failure to ensure that the North Coast Regional Control Board's CWA Basin Plan was met because the agency had failed to conduct the monitoring necessary to know the background level of turbidity. Please note that the Mt. Ashland HFRA DEIS also threatens violation of the Basin Plan and further cumulative watershed effects within this impaired watershed."

Response: The Environmental Protection Agency (EPA) delegated Clean Water Act (CWA) authority to the states. The State of California enacted the Porter Cologne Act to promulgate its CWA responsibilities, and delegated authority for regulation of water quality on Federal Lands to the State Water Resources Control Board (WRCB) with its Regional Boards. For management actions on National Forest lands, the Forest Service Pacific Southwest Region (R5) entered into a 1981 management agency agreement with the WRCB. This requires the Forest Service to institute a water quality management program to meet applicable water quality objectives, and protect beneficial uses in accordance with Regional Basin Plans. The agreement allows the Forest Service to use its State-approved and EPA-certified BMPs to protect water quality from non-point sources of pollution and thereby meet applicable Basin Plan objectives. The agreement also requires the Forest Service to monitor BMP effectiveness in meeting Basin Plan requirements. Our Forest Plan is in compliance with the Water Quality Control Basin Plan, thus the Clean Water Act.

Baseline turbidity levels were assessed for the Project using professional judgment on how fast a stream clears after a peak flow, stream surveys data for substrate conditions, and/or the CWE modeling used to estimate the existing condition and post-action condition for this indicator (B. Thomas 2007a). The risk of sediment delivery to streams is evaluated through the CWE modeling as described in B. Thomas (2007a). Project activities will result in a small but insignificant potential for mobilized sediment to cause increased turbidity in streams, and is unlikely to affect anadromous fish or their habitat (ibid.).

Compliance with CWA requirements for suspended sediment, turbidity, and other Basin Plan Objectives and Standards at the site and project scale is achieved through application of appropriate BMPs and specific measures as agreed upon with the North Coast Regional Water Quality Control Board (NCRWQCB)**.** The Forest will file a Notice of Intent (NOI) with the NCRWQCB for this project to be enrolled in the Silvicultural Waiver Program. To be granted enrollment, the NCRWQCB staff will determine that the project complies with Basin Plan

Objectives and Standards. The Forest will work with NCRWQCB staff incorporating their guidance until that enrollment is achieved; before signing a Record of Decision.

A few people commented on the scoping process and notice; the lack of detail in the DEIS document's analysis, and whether or not proper procedures have been followed.

i. "PROPER HFRA PROCEDURES HAVE NOT BEEN FOLLOWED. As stated in our letter of 10/11/05, the agency's scoping notice of 10/3/05 did not allow for substantive and meaningful public scoping regarding this HFRA project. The scoping notice simply did not provide the level of detail necessary for the public to collaboratively participate in this HFRA NEPA planning process. The 'project area' map included with the scoping notice was of such a scale and quality as to be useless for developing site-specific alternatives and comments regarding this project. Information regarding unit location, proposed new road locations, current riparian conditions, conifer species composition and seral class, soil conditions, proposed fuelbreak locations, and wildlife presence in the planning area was completely absent from the scoping notice. The scoping notice simply did not contain the necessary details and information that would allow for the statutorily required collaborative, substantive and 'good faith' scoping input from the public."

j. "Scoping is a particularly important part of the HFRA planning process. Please note that section 104 (c) of HFRA contains specific limitations and requirements regarding the development of alternatives in HFRA projects. These requirements of the public (and the agency) cannot be met if the Forest Service neglects to provide a scoping notice or Federal Register notice containing enough detail so as to allow for substantive scoping comments from the public. ...We contend that the brief and cursory scoping and Federal Register Notice did not allow for meaningful collaboration between interested persons and the planning agencies. Our organizations would very much like to collaborate with the Forest Service to develop and implement an action alternative that accomplishes the purpose and need for this project while avoiding the negative environmental impacts that accompany new road construction and group selection logging, yet all agency action alternatives call for both of those activities in this AWWC."

Response (to both i. and j.): Collaboration and public scoping are used to invite public participation, identify issues, and obtain public comment through various stages of the analysis process. That process started with collaboration between the USFS and the USFWS in developing a preliminary proposal for the Mt. Ashland LSR. The concept of a habitat restoration project was first introduced to the public during a public meeting and field trip in September of 2004. The purpose of the meeting was to provide an early opportunity for public input into the proposal. Information about the proposal was provided, including: current condition, successional stages, fire history, logging/treatment history, fire risk/hazard, road density, purpose and need, treatment recommendations, aerial photos, and maps (presented at a scale of 1:15,840). When the proposal was finalized, scoping letters were mailed (October 3, 2005) and a Notice of Intent was published (October 7, 2005). In order to ensure public understanding of the proposal and to identify significant issues and concerns, several additional meetings were held during the scoping process (October 28 and 29, 2005, November 16, 2006). During and after the DEIS comment period, a series of public field trips were conducted in 2007 to discuss public concerns about the DEIS, or the alternatives, and to clarify issues that were raised during the comment period. Field trips were held on July 10, 18, and 31; August 1, 28 and 29; September 4, and October 9, 10, and 26.

Discussion and information gathered during public field trips was used to address concerns raised during the comment period and to develop the Preferred Alternative.

k. "To 'consider' cumulative effects, some quantified or detailed information is required. Without such information, neither the courts nor the public, in reviewing the Forest Service's decisions, can be assured that the Forest Service provided the hard look that is required to provide. Such a mandate is also consistent with the Forest Service's duties under NFMA. General statements about 'possible' effects and 'some risk' do not constitute a 'hard look' absent a justification regarding why more definitive information cannot be provided."

Response: Quantitative data is always the preferred method of analysis where feasible. This project has been developed over four years and has involved very detailed analyses. Indicators of impact for each resource are described in detail within the EIS. In some instances impacts or indicators simply to not reflect negative impacts if they are slight. For example, sediment introduced to waterways in any of the action alternatives is not predicted to be measurable; thus, modeling has been used to indicate risk level. Where indicators do not reflect negative impacts, impacts are expected to be insignificant, though it is impossible to discount them entirely; thus sometimes less specific language will be used where impacts are expected to be insignificant or imperceptible.

Detailed information about other activities occurring within the analysis area for the Project—including timber harvest prescriptions, acres treated, yarding methods, timing of actions—has been obtained from adjacent landowners, adjacent national forests, California Department of Forestry, and Oregon Department of Forestry (refer to Appendix B). Effects of those activities have been considered in the cumulative effects analysis in Chapter 3 of the FEIS.

1.2 PUBLIC INVOLVEMENT PROCESS (CODE 101)

Three responses addressed the public involvement process for this project. The comments are mostly the same as those highlighted for the previous issue summary and will not be repeated here.

a. "We contend that the brief and cursory scoping and Federal Register Notice did not allow for meaningful collaboration between interested persons and the planning agencies. Our organizations would very much like to collaborate with the Forest Service to develop and implement an action alternative that accomplishes the purpose and need for this project while avoiding the negative environmental impacts that accompany new road construction and group selection logging, yet all agency action alternatives call for both of those activities in this AWWC."

Response: See response to preceding comments i. and j. in Section 1.1. Collaboration with interested parties has been on-going; starting in 2004 with development of the proposal and continuing with ten field trips conducted during and after the DEIS comment period in 2007. Collaboration since the release of the DEIS has resulted in the development of the Preferred

Alternative in the FEIS which further reduces the amount of new spur road construction. None of the action alternatives propose a group selection prescription; the only timber harvest prescription proposed is variable density thinning from below.

b. "When the time is appropriate, it'd be helpful to walk the affected section of PCT with a representative from the Klamath National Forest to discuss how the experience of the user will be protected during the timber operation."

Response: The Preferred Alternative addresses this issue by dropping stands 250, 312, 313 and 314 along the Pacific Crest Trail. No vegetation treatment activities are proposed in or near the Pacific Crest Trail corridor (200'). Team leader, Sue Stresser, or landscape architect, Jerry Mosier, can be contacted about a field review of the proposed project. Scenery Design Standards (Appendix E) have been included in the action alternatives to minimize effects on scenery along the Pacific Crest Trail.

1.3 CONSULTATION /COORDINATION (CODE 102)

There were no comments received on this particular issue.

1.4 PURPOSE AND NEED (CODE 103)

Several respondents are concerned that certain activities, particularly road construction in impaired watersheds, will obstruct attainment of the project's purpose and need. Another respondent feels the widespread creation of logging slash may directly inhibit attainment of the purpose and need. One respondent compliments the Klamath National Forest on how well the purpose and need agrees with those purposes identified for management within Late Successional Reserves and the Healthy Forest Restoration Act.

a. "Our organizations support the purpose and need for this project. Indeed, in our scoping comments of 10/28/05 we submitted a Citizens' Alternative pursuant to HFRA, designed to accomplish the stated purpose and need for the project while avoiding new road construction in this AWWC and LSR. Unfortunately the Forest Service refused to develop, analyze or implement an action alternative that met the stated purpose and need for the project while avoiding new road construction in the impaired watersheds of the Mt. Ashland LSR.

b. "the agency failed to develop or analyze a reasonable action alternative to achieve the purpose and need for the project while avoiding the impacts associated with tree-removal for "temporary" road construction on NSOs, critical habitat, hydrological, soil and other forest values."

Response: The two main objectives from the purpose and need are to (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-successional forest related species. The action alternatives in the FEIS would accomplish these objectives. A no temporary spur road construction alternative was developed

but eliminated from detailed analysis because it had watershed effects that were similar to the other alternatives (i.e. the effects were not measurably lower than the other action alternatives--<.03 difference in modeled risk ratio) and may not have been feasible to implement due to economic reasons. In the DEIS, three action alternatives with temporary spur road construction ranging from 6.86 to 2.27 miles were developed. The main reasons for designing Alternatives 4 and 5, which propose 4.96 and 2.27 miles of temporary spur road, respectively, were to minimize impacts to NSO and NSO critical habitat and to minimize cumulative watershed effects. In response to comments received on the DEIS, the Forest developed a Preferred Alternative that reduced the construction of temporary spur roads to 1.70 miles and limits spur construction to ridges and upper slope to minimize potential watershed effects. The main reasons for designing the Preferred Alternative was to address issues associated with spur construction, tractor yarding, mastication, helicopter yarding, available landings and increased use of underburning to reduce fuels.

From a soils perspective, the effects of cutting trees in areas where temporary roads are built are minimal to none. The effects associated with road building are related to how much soil is displaced and compacted. The amount of existing and proposed temporary roads does not exceed 15% threshold as allowed in the Regional Soil Quality Analysis Standards and LRMP.

c. "the DEIS (3-86) anticipates that for 3 to 5 years after logging 'many proposed treatment stands would also be best represented by a slash fuel model"[and that] this fuel model would display [the] worst case for fire behavior.' The KNF knows that both the Yellow fire (47,500 acres) and the Specimen fire (7,000 acres) originated in logging slash. Hence the widespread creation of logging slash may directly inhibit the attainment of the project's purpose and need."

Response: The DEIS acknowledges that untreated logging slash is a potential threat until the fuels treatment is completed. This is partially related to scheduling of contracts and work, but there is also an ecological basis for delayed treatment as well. Optimally, there will be a lag phase between fuel generation (logging slash) and treatment. Delaying allows fuels to dry and thus burn more completely with less production of smoke and related particulates. This is an important air quality consideration. Also recent research shows that there is less damage to residual trees if fuels treatments are delayed to allow trees to physiologically adapt to their new environmental conditions (Safford 2007). Any action involves some degree of temporal and spatial scale trade-offs. It is believed that the short-term (1–5 years) increase to fire hazard from generation of untreated logging slash within select units representing a minority of the landscape is offset by the long-term gain of creating favorable conditions to restore fire to the larger landscape through prescribed fire, Wildland Fire Use (WFU) and/or Appropriate Management Response (AMR).

d. "We do not believe that new logging road construction, group selection logging, ground-based yarding or slashbuster mastication on steep slopes will contribute to attainment of the purpose and need for this project."

Response: The two main objectives from the purpose and need are to (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-succession forest related species. The action alternatives in the FEIS would accomplish these objectives. The Preferred Alternative was developed after the DEIS, it addresses this issue and proposes less temporary spur construction than the other alternatives and limits spur construction to ridges and upper slopes to minimize potential watershed effects. None of the action alternatives propose a group selection prescription; the only timber harvest prescription proposed is variable density thinning from below. Based on public input, mastication will be limited to slopes <35% for all action alternatives; this is a modification to the project description presented in the DEIS.

e. "The purpose and need for the project are consistent with those identified for management within Late-Successional Reserves (LSR) and the Healthy Forest Restoration Act (HFRA). I applaud the Forests initiative to utilize HFRA for this project. It is also apparent the Klamath NF Forest Wide LSR Assessment (FLSRA) was utilized in developing desired conditions and the associated management prescriptions."

Response: Positive comment, no response warranted.

1.5 COMPLIANCE WITH NEPA PROCESS (CODE 104)

Three respondents addressed non-compliance with the National Environmental Policy Act by the USDA Forest Service (USFS) by failing to provide data or evidence to support a conclusion; failing to disclose the cumulative impacts from the management activities; failing to provide any evidence that water quality objectives are currently being met; and demonstrating that beneficial uses are being protected. They believe the DEIS violates NEPA's requirement that Federal actions do not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

a. "Even with the questionable outcomes alleged by the KNF for this timber sale, the intent of the North Coast Water Quality Control Plan (WQCP) would be violated. [NOTE: Referenced in DEIS?]...The DEIS does not contain any hard data or evidence to support the conclusion that the WQCP objectives will be met by this project. By failing to provide data or evidence to support a conclusion, the DEIS violates NEPA. By failing to provide any evidence that water quality objectives outlined in the Basin Plan are currently being met, that beneficial uses are being protected, and that the proposed timber sale will not violate those objectives, the DEIS fails to demonstrate compliance with the Basin Plan, and violates NEPA's requirement that Federal actions do not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment."

Response: Please refer to response to comment 1.1h. on p. 11.

b. "There are several Timber Harvest Plans (THPs) in close proximity to the proposed logging and their impacts will be cumulative on wildlife habitat and the hydrological health of the Beaver Creek watershed and they must be considered together under NEPA. 40 CFR §1508.27(b)(7). Additionally, the USFS is

planning the Ashland Forest Resiliency (AFR) timber sale in the same LSR. AFR will occur within the same NSO home ranges as the Mt. Ashland DEIS."

Response: Cumulative effects analysis for wildlife species included all reasonably foreseeable future actions, including Timber Harvest Plans, within the Project Area as described in the FEIS Section 1.5. A list of all the projects considered, including the Ashland Forest Resiliency Project, can be found in Appendix B. Cumulative effects analysis for NSOs considered all reasonably foreseeable future actions in the Project Area as well as actions in the estimated 1.3 mile home range of known and historic sites that overlap with proposed project treatments. Cumulative effects for Pacific fisher also considered all reasonably foreseeable future actions in the Project Area as well as a 1.5–2 mile buffer around the Project Area. All timber harvest plans within the above described NSO and Pacific fisher analysis areas were included in the cumulative effects analysis. Cumulative effects to wildlife species are disclosed and analyzed on pp. 18–79 of the wildlife BA/BE and in Section 3.2.6–3.2.28 of the FEIS.

The Cumulative Watershed Effects Analysis Report analyzes all past actions on public and private lands. Future foreseeable actions, public and private, were analyzed as well. One Timber Harvest Plan, North Klamath, has been introduced since the DEIS was issued. Analysis of cumulative watershed effects for the North Klamath Timber Harvest Plan and for the Preferred Alternative can be found in the Addendum to the Cumulative Watershed Effects Report (Bousfield et al. 2008) and in the Addendum to the Watershed Report (Snavely 2008b).

c. "the Ninth Circuit rejected the cumulative impacts analysis in an EIS because it referred in general terms to "development projects" and "ongoing urbanization" rather than identifying these projects and their impacts. Carmel by the Sea v. US Dept. of Transportation...For the Mt. Ashland LSR and AWWC logging project, the Forest Service's failure is even greater. It is not a diffuse "ongoing urbanization" that is impacting the listed species in the watershed; Rather here we see a series of timber sale projects are being implemented that result in cumulative impacts to a single LSR. NEPA requires disclosure of the cumulative impacts from these timber sales."

Response: See response to comment 1.1a and 1.5b on pp. 5 and 16. The FEIS analyzes all past actions on public and private lands. Future foreseeable actions, public and private, were analyzed as well (Appendix B) (Elder 2006).

1.6 CONFORMANCE OR CONFLICTS WITH FOREST PLANNING DOCUMENTS (CODE 105)

Comments relating to conformance with NFMA and Forest Planning Documents.

a. "The purpose and need for the project are consistent with those identified for management within Late-Successional Reserves (LSR) and the Healthy Forest Restoration Act (HFRA). I applaud the Forest's initiative to utilize HFRA for this project. It is also apparent the Klamath NF Forest Wide LSR Assessment (FLSRA) was utilized in developing desired conditions and the associated management prescriptions."

Response: Positive comment, no response warranted.

b. "All the proposed action alternatives are consistent with Aquatic Conservation Strategy (ACS) objectives such as maintaining water quality, retaining large trees and snags and the retention of coarse woody debris. The Klamath National Forest (KNF) Beaver Creek Ecosystem analysis also recommends reductions in road density and fuels within watersheds." [Letter from Environmental Protection Agency]

Response: Positive comment, no response warranted.

c. "It is important to note that the Klamath Forest Plan requires that 'Project-level planning should review the opportunities available to improve or maintain aquatic habitat. Through the interdisciplinary process, the cause of the problem should be identified and treated as well as the effects.'"

Response: The KNF LRMP citation above refers to project-level planning for aquatic habitat restoration projects. The purpose and need for the Mt. Ashland LSR Project is to (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-succession forest related species. Although, during the IDT process, opportunities to improve aquatic habitat were identified, they were not included within the proposed action because they did not meet the purpose and need. Separate aquatic habitat restoration projects may be proposed in the same area in the future and will be analyzed separately.

Conflicts with NFMA and Forest Planning Documents: A few respondents are critical of the reliance on Best Management Practices (BMPs) to meet the Clean Water Act and the Basin Plan. Some also call for on-the-ground surveys as required by NFMA instead of relying on MIS habitat modeling.

d. "The USFS should be aware that the National Marine Fisheries Service (NMFS) criticizes the use of Best Management Practices (BMPs) and mitigation as poor surrogates for addressing cumulative watershed effects because BMPs are addressed to individual actions and fail to do limit the totality of individual actions within a watershed."

Response: The National Marine Fisheries Service and the USFS consulted on the list of BMPs for this project and reached an agreed-upon list of project specific BMPs. The list of BMPs is an Appendix A of the Fish BA of which the agreed-upon Endangered Species Act determination is that the project "May Affect, Not Likely to Adversely Affect" coho salmon and coho critical habitat (B. Thomas 2007b, 84) (also refer to Appendix D of the FEIS for a list of BMPs).

BMPs are not used as a surrogate for a cumulative effects analysis. They are simply erosion control measures that can be tied to the Timber Sale Contract to ensure implementation. BMPs are included as part of the proposed action to minimize effects of individual actions. The cumulative watershed effects analysis was performed and is contained within Elder (2006) and the DEIS. It has been updated to reflect project modifications from the time the DEIS was issued.

e. "The Forest Service cannot argue that the KNF LRMP, the NFP FEIS or the Watershed Analysis provides an analysis of cumulative impacts. The courts have held that a forest-wide Land and Resource Plan cannot substitute for the cumulative impacts analysis which is required in an environmental document prepared for a site-specific project."

Response: The KNF does not contend that the Forest Plan, the Northwest Plan, or any Watershed Analysis substitutes for a project-specific cumulative watershed effects analysis. The Cumulative Watershed Effects Analysis Report (Elder 2006; Bousfield et al. 2008) and FEIS (see Section 3.4) contain the requisite analysis.

f. "Management Indicator Species. The DEIS establishes that the Forest Service is relying on MIS habitat modeling and not conducting on the ground surveys as required by NFMA."

g. "the Klamath National Forest violated its LRMP, and NFMA, by failing to monitor and survey for snag associated MIS species in this very same watershed via the illegal Beaver old-growth timber sale."

Response (to both f. and g. above): Please refer to comment response 1.1 g. on p. 10.

h. "'…the Forest Service violated NFMA by failing to demonstrate how the Project maintains the existing condition or moves it within the range of natural variability.' Klamath Siskiyou Wildlands Center et al. v. United States Forest Service, US District Court, Eastern District of California (2004) p. 45."

Response: The Fire Regime Condition Class (FRCC) assessment shows departure from historic reference conditions and by inference from treatment objectives, how the project moves the landscape closer to historic range of variability. The following summarizes departure of fire return intervals and seral stages from historic conditions:

> Current (1910-2005) fire return intervals exceed historic averages: approximately 89% of the Mt Ashland LSR Project Area has not experienced a wildfire since 1910, and approximately 74% of the Project Area is characterized as severely departed (condition class III) and approximately 22% as moderately departed (Condition Class II) by the FRCC(FRI) measure.
>
> By the FRCC (VS) (VS = Vegetation Structure) measure, which measures current departure from modeled pre-settlement distributions of seral stages (defined by overstory tree composition, canopy cover and diameter), approximately 83% of the Project Area is moderately or severely departed (condition classes II and III). The severely departed lands (condition class III) are dispersed widely across the Project Area, but most are in the Ponderosa Pine and Jeffrey Pine /Mixed Conifer types (60%), Red Fir – White Fir (24%) or White Fir mixed conifer (16%) zones. It is apparent from this that the lower elevation pine-mixed conifer types show the greatest structural departure of all the vegetation types in the project area. (Creasy 2008)

Historically this area burned frequently and at low intensity with patchy patterns of mortality; therefore, a mosaic pattern of stand structure made up the historical landscape. Currently the

Project Area is dominated by mid-seral trees. By treating these stands with a variable density thinning the resultant stands will better resemble historic mosaic patterns.

i. "The Klamath Land Resource Management Plan requires that 'Project areas should be surveyed for the presence of sensitive species before project implementation.' ROD Standards and Guidelines p. 6-8; LRMP p. 4-23. 'If surveys cannot be conducted, project areas should be assessed for the presence and conditions.'"

Response: Project-specific surveys were conducted for the following Region 5 Sensitive Species: northern goshawk, blue-gray taildropper, Tehama chaparral, Siskiyou Mountains salamander, and Sensitive plants. The likelihood of species presence for the remaining Region 5 Sensitive Species was assessed in the Project BA/BE and was based on the known range of the species, other surveys conducted on the Forest, and the presence of suitable habitat within the Project Area. If the project is in the range of a Sensitive species, the condition of habitat and the effects on that habitat were analyzed in the wildlife BA/BE (pp. 26-55) and the FEIS (Section 3.2.6 through 3.2.20).

j. "the Klamath Forest Plan ROD directs that a cautious approach be taken with respect to future land management activities in AWWCs and that these 'activities be tailored to achieve watershed recovery.' We do not think that the agency is applying a 'cautious approach' to logging AWWCs when it proposes logging and yarding techniques that raise the risk ratios for cumulative watershed effects in every single action alternative that is developed in the DEIS."

Response: Section 3.4.2 of the FEIS references the Forest Supervisor's letter of direction (Boland 2006). This letter clarifies the "cautious approach". The Klamath Forest Plan Record of Decision does not contain a requirement to "demonstrate no increase of the equivalent roaded area" due to the AWWCs designation. The Record of Decision's entire discussion of Areas With Watershed Concerns is reprinted here:

> Based on the potential effects at the watershed level as identified by a disaggregation model for sediment production, a cautious approach will be taken in areas with watershed concerns, particularly with regard to timber harvesting and road construction activities. Watershed analysis as part of ecosystem analysis will be required prior to implementing site-disturbing activities in the areas identified on the attached map to determine the kind and degree of concerns.

The concept of Areas With Watershed Concerns was not part of the Northwest Forest Plan, nor was it discussed in the Klamath Forest Plan or the associated Environmental Impact Statement, so this statement from the Record of Decision is the only Forest Plan guidance available for lands under this designation.

Many had comments pertaining to the Late Successional Reserve Assessment and its findings.

k. "The DEIS states many times that the project area is approximately 30% under the desired level, which is 60-65%, for late-successional characteristics. This statement does not reflect statements found in the FLSRA. Page 2-98 of the FLRSA states that the eastern LSRs, including Mt. Ashland, "should be able to maintain 45-65% of the capable ground as late-successional at any one time." A true reflection of the current condition should state the Mt. Ashland LSR is currently 17% below the minimum desired range for Late-Successional habitat and 37% below the maximum desired range. Treatments still need to occur in order to meet the long term desired range for this LSR but the situation is not as negative as stated in the DEIS."

Response: While the Forest Wide LSR Assessment states that the Mt. Ashland LSR should be able to maintain 45–65% of the capable ground as late-successional at any one time the Mt. Ashland LSR Assessment states 60–75% of the LSR should be maintained in late-successional condition. Because the desired future condition in these two analyses differ, we selected the range that was consistent between these analyses (60–65%) to evaluate the current condition relative to the desired future condition. That is why our analyses states that the Project Area is approximately 50% under the desired level of late-successional habitat.

l. "The Mt. Ashland LSR Assessment (RO-248) contains a number of findings indicating that new logging roads are not an appropriate management activity for a project intending to aid the health of the LSR and the watershed."

Response: The Mt. Ashland LSR Assessment suggests that road densities exceeding 2 miles per square mile of road reduces habitat quality for some species, increase harassment to wildlife, and can fragment late-successional habitat. During project implementation total road density will increase in project subwatersheds but will decrease post-project. While the construction of temporary spur roads will have some impact to wildlife and their habitats these impacts are expected to be minimal and short-term because all spur roads constructed for the project will be decommissioned and restored post-project and 0.49 miles of existing road will be decommissioned. An additional 8 miles of unauthorized road will be hydrologically stabilized and closed. Thus, post-project total road density in all subwatersheds will either decline or remain the same as pre-project levels. Temporary roads for this project are designed to access mid-successional stands for restoration silviculture treatments and to create defensible fuel profile zones. Therefore, by promoting the development of late-successional forests and by creating a landscape that is more resilient to catastrophic wildfire, the long-term benefits to LSR health and function are expected to outweigh the short-term impacts of temporary road construction.

m. "IMPAIRED WATERSHEDS WITHIN A LATE SUCCESSIONAL RESERVE MUST NOT BE FURTHER DEGRADED...the DEIS considers three action alternatives that all call for significant new 'temporary' road construction, ground-based yarding activities, the construction of numerous landings, group selection logging, and yarding activities (including road construction) in riparian reserves. We believe that these practices are inappropriate for a Health Forest Restoration Act (HFRA, HR 1904) project located within a Late Successional Reserve (LSR) that serves as Spotted Owl Critical Habitat (CHU CA-14 and CHU OR-76) within Areas with Watershed Concerns (AWWCs) as designated by the Klamath LRMP."

Response: The proposed project is consistent with HFRA because loss of habitat to wildfire has been identified as a threat to the threatened northern spotted owl which occurs in the project area. The project will provide enhanced protection from catastrophic wildfire for NSOs, their habitat and their Critical Habitat.

The impacts, both direct and indirect, to the Mt. Ashland LSR and NSO Critical Habitat units CA-14 and OR-76 are disclosed in the FEIS in Sections 3.2.4 and 3.2.5. Conclusions reached in that document were that, although there will be short-term impacts associated with project implementation, over time the proposed thinning and fuels reduction treatments are expected to enhance the function of the LSR and the critical habitat units and reduce fuels to a level that would result in less severe fire behavior. Therefore, the Forest believes that this project is consistent with the HFRA in that it reduces the risk of catastrophic wildfire and protects and restores forest ecosystem components.

Group selection timber harvest prescriptions, road construction or landing construction within Riparian Reserves are not proposed in any of the action alternatives. Group selection prescription is not proposed in any of the alternatives. The action alternatives call for minor temporary spur construction (ranging from 6.86 miles in Alternative 2 to 1.7 miles in the Preferred Alternative), landing construction, and ground based yarding (e.g., tractor, tractor endline) in order to facilitate removal of small trees using a variable density thinning prescription. Thinning of stands will reduce density, enhance forest development, favor large trees, reduce ladder fuels, and minimize risk of crown fire (FEIS Section 3.3.3). Fifty years post-treatment, average tree diameter would be twice as large as stands left untreated (i.e., no action alternative) (FEIS Section 3.1.4) and there would be 15-25% more trees >24" DBH (FEIS Section 3.1.4. An alternative without spur road construction was considered as described in the FEIS on Section 2.4.5. An alternative without commercial timber harvest was not considered because it would not meet the Project Purpose and Need regarding habitat promotion and reduced ladder fuel through tree density reduction. While hand-treatments (e.g., pre-commercial thinning, pruning, hand-ignited underburning) alone would provide some reduction in ground and ladder fuels; habitat development, white fir encroachment, over-dense stands, and potential for extreme fire behavior would not be adequately addressed without timber harvest.

Grouse Creek has been identified in the LRMP ROD (1995c) as an Area with Watershed Concerns (AWWC). As such, Forest direction calls for a "cautious approach" when implementing site disturbing activities (Boland 2006). For the Mt. Ashland LSR Habitat Restoration Project, a caution approach was taken by: designing a project that will improve forest health, implementing recommendations in the Beaver Creek Ecosystem Analysis, retaining large trees, maintaining canopy closure above 40% in habitat promotion stands, use of BMPs, establishment of riparian

vegetation buffers, not allowing heavy equipment to operate within 170' of streams, limiting masticators and tractors to slopes less than 35%, minimizing spur road construction and not crossing Riparian Reserves with spurs. With the action alternatives there will be short-term, insignificant increases in sediment but the project will provide long-term benefits to the watershed (FEIS Pg. 3-140). With a no-timber-harvest or no action alternative, the long-term impacts from stand-replacing wildfire would include increases in potential peak flows, increased erosion, and the potential for significant increases in delivered sediment to stream channels (Bousfield et al. 2008;Snavely 2007a, 2008b).

1.7 HEALTHY FOREST RESTORATION ACT PLANNING PROCESS (CODE 106)

One respondent applauds the Forest's initiative to utilize HFRA for this project. Others commenting on this issue claim proper HFRA procedures have not been followed. The objections mainly address the scoping process and whether the activities outlined in the action alternatives are appropriate for a HFRA project located within a Late Successional Reserve. Those comments are also included in the summary for Codes 100 and 200.

a. "The purpose and need for the project are consistent with those identified for management within Late-Successional Reserves (LSR) and the Healthy Forest Restoration Act (HFRA). I applaud the Forests initiative to utilize HFRA for this project."

Response: Positive comment, no response warranted.

b. "The HFRA prohibits removal of old growth forest structure...The Congress specifically intended for covered projects to retain existing older forest structure that existed prior to fire suppression...Age or diameter limits to protect older forest structure, consistent with the HFRA, should be a required mitigation measure for the proposed action."

Response: HFRA does not prohibit the removal of old growth forest structure. Specific guidance is given in the Forest Service Interim Field Guide (USDA Forest Service 2007n):

> Section 102(e)(2) provides that the USDA Forest Service and DOI BLM, when carrying out covered projects using HFRA authority, are to "fully maintain, or contribute toward the restoration of, the structure and composition of old-growth stands according to the pre-fire suppression old-growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health, and retaining the large trees contributing to old-growth structure…In areas where large-tree retention requirements apply, resource managers should design projects that retain large trees to the extent possible, while they also: (1) are appropriate for the forest type, (2) will reduce uncharacteristically severe wildland fire effects within the treated area, and (3) will meet the objective of reducing wildland fire risk to communities, municipal water supplies, and at-risk Federal land."

Old-growth forest conditions are rare on this landscape due to past logging. Untouched old-growth does not occur in the Project Area. Old-growth trees were not considered for silvicultural treatment in this project and will not be affected by the project. In order to meet the purpose and need of the project, and to mimic pre-fire suppression characteristics of the landscape, denser canopies and trees over 20" in diameter will be retained at mid- and lower slope positions on the landscape. On ridges, stands will be more open and the largest trees will be favored consistent with the appropriate forest type for the area (FEIS Table 2-5).

c. "As stated in our letter of 10/11/05, the agency's scoping notice of 10/3/05 did not allow for substantive and meaningful public scoping regarding this HFRA project. The scoping notice simply did not provide the level of detail necessary for the public to collaboratively participate in this HFRA NEPA planning process…The scoping notice simply did not contain the necessary details and information that would allow for the statutorily required collaborative, substantive and 'good faith' scoping input from the public."

Response: Please refer to comment addressing points 1.1i and 1.1j on p. 12.

d. "the DEIS considers three action alternatives that all call for significant new 'temporary' road construction, ground-based yarding activities, the construction of numerous landings, group selection logging, and yarding activities (including road construction) in riparian reserves. We believe that these practices are inappropriate for a Health Forest Restoration Act (HFRA, HR 1904) project located within a Late Successional Reserve (LSR) that serves as Spotted Owl Critical Habitat (CHU CA-14 and CHU OR-76) within Areas With Watershed Concerns (AWWCs) as designated by the Klamath LRMP."

Response: Please refer to comment addressing points 1.6m on pp. 21, 1.7b on pp. 23 and 1.9o on p. 45.

1.8 NEW DATA/REPORTS, CORRECTIONS, OR ADDITIONAL INFORMATION NEEDED (CODE 107)

Several respondents, including the Environmental Protection Agency, call for additional cumulative effects analysis. Additional comments are included in the summary for Code 108, Cumulative Effects Analysis Needed.

a. "The Mt. Ashland DEIS doesn't show that the generic ERA/TOC method used throughout Region 5 fits the unique hydrological characteristics of this watershed. Its hydrology is distinct, given its largely granite composition and steep incised stream canyons which are most vulnerable to reductions in canopy closure and increases in soil compaction."

Response: The CWE models used for the project, which include the ERA/TOC method, have been refined several times from 1998 to 2004. In addition, they are updated with additional disturbances and Private land Timber Harvest Plans on a project-by-project basis. The foundation for data used in the model ("geo13") was created using a combination of Forest specific layers including bedrock geology, geomorphology, active landslides, inner gorges, and a two-slope-class DEM-generated coverage (Elder and Reichert 2004). The "geo13" coverage divides the landscape

into 15 geomorphic terrains; these terrains exhibit different rates of sediment delivery from mass-wasting processes as determined by the Forest specific Salmon Sediment Analysis (de la Fuente and Haessig 1994) which was developed for granitic soils.

The Region 5 generic ERA/TOC method differs from the Klamath in that the generic method would assign a Threshold of Concern (TOC) of 12% to all watersheds within the project area. This implies that 12% of the area could have disturbance before peak flow impacts may be starting to occur. The Klamath model allows each watershed to assign its own TOC. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability of each watershed. The TOC ranges 6–8% within the project Area.

b. "Attached to these comments you will find a published, peer-reviewed paper by Dr. Tim Ingalsbee entitled Fuelbreaks for Wildland Fire Management: A Moat or a Drawbridge for Ecosystem Fire Restoration. This paper raises numerous issues regarding fuelbreak construct that are of concern to our organizations and our memberships. Some of those concerns are: The need to reconceptualize fuelbreaks; location; dangers of canopy removal; and maintenance."

Response: From Ingalsbee paper:

> The adverse effects of past fire exclusion on fuel loads and fire behavior are often considered to be the primary purpose for constructing fuelbreaks, and land managers argue for the need to create infrastructure for future fire suppression activities. But this forms the basis for critiques that challenge the underlying purpose and need for fuelbreak proposals: they are almost exclusively intended to facilitate fire suppression actions and further fire exclusion objectives. **Without explicit plans to use fuelbreaks to help reintroduce prescribed fire or manage wildland fire use, there is an inherent contradiction in proposals to construct fuelbreaks to limit the size of wildfires— and thus further fire exclusion—in places identified as fire-adapted or fire-dependent ecosystems** (emphasis added).

The Klamath National Forest has an approved Wildland Fire Use Plan and has implemented it in recent years with the primary objective of restoring the role of fire in ecosystems. The KNF also has a history of embracing Appropriate Management Response to allow wildfires to burn more naturally while minimizing suppression activities. DFPZs and other fuel reduction activities will enhance the ability of managers to more effectively implement prescribed fire, WFU and AMR in the project area and surrounding areas. For these reasons, the potential conflicts noted above by Ingalsbee are largely addressed. Another citation from Ingalsbee:

> More research using field experiments or computer modeling could help design new fuelbreaks intended primarily for starting prescribed fires or steering wildland fires in addition to stopping wildfires when conditions warrant full suppression. This expanded role for fuelbreaks would thus serve more ecological objectives, answering a primary concern of critics.

The KNF uses computer modeling (FVS-FFE, FLAMMAP, BEHAVE) to predict fire behavior under different scenarios of fire weather and fuel conditions to help develop landscape prescriptions. Also, during wildfire events, fire planners provide daily computer simulations of fire behavior based on fuels, weather and topography. These simulations of fire behavior are used to direct suppression activities including actions under AMR and WFU.

Regarding the issue of canopy removal, the effect of the overstory canopy to reduce understory live fuels of shade intolerant species is recognized. The prescriptions are designed at a landscape scale to balance the effects of understory suppression with the need to reduce canopy bulk density (the quantitative measure of crown fuels) so that a reduction in active crown fire potential can be achieved. Treatment units are spatially located in areas that historically had greater structural heterogeneity due to disturbance history. Treating these areas will help to protect NSO habitat values in high quality habitats with different fire regimes as largely determined by topographic position and corresponding lesser fire frequencies and intensities. Such considerations for treatments at the landscape scale are warranted in developing strategies for managing LSRs in the dry provinces of the NWFP (Spies et al. 2006). Furthermore, many species contributing to ladder fuels and increased canopy bulk density are shade tolerant species (white fir and Douglas-fir to a lesser degree) and maintaining high canopy cover values will not address these contributors of fire spread and severity.

The maintenance issue is best addressed on a site by site basis. DFPZ or fuelbreak maintenance needs will diminish as fire is allowed to play a more natural role in wildland landscapes outside of the Wildland Urban Interface (WUI). This is a long-term strategy of the KNF, to restore fire to its more natural role in local ecosystems.

c. [EPA] "EPA recognizes that providing high quality drinking water to protect human health is a high priority for land management agencies. Activities such as timber harvesting, and road building, may adversely affect waters that serve as sources of drinking water for communities. The EIS does not discuss whether there are source water protection areas within or downstream of the project area and whether the project will impact these areas."

Response: Municipal and domestic water intakes are considered "beneficial uses" and are discussed in the Watershed Report (Snavely 2007a, 2008b). There are no municipal intakes within the project area; the nearest municipal source is more than 10 miles downstream along the Klamath River. There are individual domestic intakes downstream of the project area, but they are located generally in smaller streamcourses that connect to Beaver Creek but are unaffected by or uninfluenced by the proposed project activities. These streamcourses are not hydrologically connected to Deer, Long John, or Grouse Creeks which flow from the project area.

d. [EPA] "The EIS needs to discuss the actions were taken to identify all federally-regulated and state regulated source water protection areas, within and downstream of the project area. If source water protection areas will be impacted by the proposed project, the EIS needs to discuss what those impacts may be and the measures that would be taken to protect them.

Response: All streams within the project area are under the auspices of the California State Clean Water Act, thus the California North Coast Regional Water Quality Board. The project design features in the EIS spell out the protection provided to streams. There are no municipal or domestic water sources within the project area and streams within the project area do not flow into domestic source streams in the Beaver Creek Watershed, therefore, there are no source water protection areas identified within or downstream of the Project Area.

One respondent suggests an alternate way of presenting watershed effects indicators in the DEIS.

e. "Section 3.4.1.1, Watershed Effects Indicators, page 3-122, second paragraph. It would benefit the reader if an explicit definition of how the 'risk ratio' is derived and if the quantities being compared could be provided for each of the three models. This would help the reader assess how much weight to place on values that are just over, or just under, the tipping point of 1.0 compared to values that are far from 1.0. In addition, the original values for risk ratios for current conditions (Table 3-29 on page 3-131) should be repeated on Tables 3-31 through 3-33, which show change in risk ratios. This would allow the reader to quickly add the change to the original value to better assess potential impacts of the alternatives."

Response: Clarification and revisions are reflected in the Aquatic Resources Analysis Methods Section in the FEIS to address this comment (please refer to Section 3.4.1.1). Changes have also been to the tables as requested (though their numbering has changed).

Several respondents claim there are many statements of fact about species that reference surveys conducted for species in the analysis area. They assert that while some of these statements have supporting documentation, many do not. Statements of fact about species, statements regarding the effects of the proposed action on species, and statements on previous studies on species need to have supporting references. For surveys, these respondents feel citations should be provided wherever feasible and when these are not available, information should be provided such as who conducted the survey, when it was done, and where results can be found (in project files).

f. "If surveys indicate that the Flystain historic site is not occupied by breeding Goshawks, seasonal restrictions may be waived." (page 2-19)

Response: The Flystain Creek site is a historical goshawk activity center. As part of project design, a seasonal restriction will be used to minimize project effects on goshawks at that site. The Forest may elect to conduct additional surveys pre-project to determine the status of the site. If surveys indicate that the site is not occupied, the seasonal restriction may be waived. To date pre-project surveys for the Flystain Creek historic site have not been initiated. All Goshawk

survey results for the project are on file at Yreka Fish and Wildlife Office, Yreka, CA (USDI Fish and Wildlife Service 2007a).

g. "If surveys indicate that suitable habitat is not occupied by great gray owls, seasonal restrictions may be waived." (page 2-20)

Response: Surveys have been conducted by the Rogue River National Forest in the vicinity of the project on the Siskiyou Crest with no great gray owls detected (see Section 3.2.9 of FEIS). project specific surveys for great gray owls have not been conducted. The survey protocol for great gray owls is "intended to provide a method of determining presence and absence of great gray owl breeding pairs within proposed project areas with a reasonable level of assurance" (Qunitana et al. 2004). Therefore, if surveys were conducted to protocol and they were negative, it would be reasonable to amend project conservation measures that are reliant upon species presence. The project will not remove great gray owl habitat; however, seasonal restrictions were established to ensure that project actions that create smoke or noise above ambient levels adjacent to potential habitat would not disrupt normal breeding activities of great gray owls. If protocol surveys determine owls are not present then seasonal restrictions would serve no function.

h. "Most recently, the first year of two-year protocol surveys [for NSOs] was completed for the entire Project Area in 2006. These surveys indicate that...young." (page 3-41)

Response: All survey results for the project are on file at Yreka Fish and Wildlife Office, Yreka, CA (USDI Fish and Wildlife Service 2007a).

i. "In the long term, thinning treatments are expected to benefit marten by increasing the amount and distribution of denning and resting habitat as well as provide complex structure near the forest floor."(page 3-56)

Response: In the western United States, martens inhabit mature, late-successional stands of mesic coniferous forests and are often associated with high-elevation spruce-fir forests (Buskirk and Powell 1994; Powell et al. 2003). Complex structure near the forest floor such as low hanging limbs, logs, stumps, and/or squirrel middens are important to martens because they provide subnivean access to prey, cover from predators, and thermoregulation (Buskirk 1984; Buskirk and Powell 1994; Buskirk and Ruggerio 1994; Powell et al. 2003). Large-diameter logs, snags, or live trees are important structures for denning and resting sites (Buskirk 1984; Buskirk et al. 1989; Ruggiero et al. 1998). Therefore, it is reasonable to assume that promoting the development of late-successional forest will benefit the American marten over time.

j. "Habitat for Siskiyou mountains salamanders in the Project Area is limited to isolated pockets of shaded talus." (page 3-64)

Response: Siskiyou Mountains salamanders are considered to be a talus or forested rocky habitat obligate (Clayton and Nauman 2005). While the species will occupy habitat with a wide range of canopy closure values, closed canopies may be more important in the drier, hotter southern portion of the species range (Ollivier et al. 2001). Recent research by Welsh et al. (2007), suggested that forested stands that have the ability to sustain moist microclimates are among the best predictors of salamander presence. With this understanding of Siskiyou Mountains salamander habitat, all project stands were reconnoitered, and potential habitat recorded. A list of stands containing potential habitat can be found in Section 3.1.3 of the DEIS. All survey results for the project are on file at Yreka Fish and Wildlife Office, Yreka, CA (USDI Fish and Wildlife Service 2007a).

k. "Surveys for this species [Siskiyou mountains salamanders] adjacent to the Project Area failed to detect the presence of Siskiyou mountains salamander. Pre-disturbance surveys for Siskiyou mountains salamander were conducted...respectively." (page 3-64)

Response: Surveys for this species [Siskiyou Mountains salamanders] adjacent to the Project Area failed to detect the presence of Siskiyou Mountains salamander. Pre-disturbance surveys for Siskiyou Mountains salamander were conducted ... respectively (USDA Forest Service 2002e). All Siskiyou Mountains salamander survey results are on file at the Scott/Salmon Ranger District of the Klamath National Forest, Fort Jones, CA (USDA Forest Service 2007o).

l. "The agency does not provide any analysis or data on current populations of MIS to support its conclusion that the viability of these species is not likely to be threatened by the increased fragmentation from landing and road construction proposed in the timber sale. Please note that the DEIS (3-77) and MIS Report rely upon surveys that are over a decade old in analyzing impacts to avian communities."

Response: See response to comment 1.1f and 1.1g (pp. 9–10) for a discussion of MIS Snag Species Association and the appropriate assessment of effects on MIS by considering data and analysis relating to habitat. For the MIS species in the Marsh/Lake/Pond association and the birds, mammals, and amphibians in the River/Stream association, there is little available information regarding current distribution and abundance of these species in the Project Area. The impacts to these species from landing and road construction were analyzed in the MIS Report [pp. 15–21 and in the Wildlife Specialist Report (Johnson 2007)]. In these documents, landing and road construction were determined to have no effect or impacts were expected to be very limited in size and duration. Therefore, it is reasonable to conclude that these actions are not likely to affect the viability of these MIS populations regardless of their current status. As with many of the MIS species, current population data for other avian species in the Project Area is lacking. However, because no timber harvest on Federal lands outside of plantation thinning or wildfires of any kind have occurred within the project since 1990, there has been little change to habitat since that time. Therefore, surveys conducted in the 1990s are expected to provide a reasonable estimate of the current avian community.

m. "The DEIS (3-20) acknowledges that group selection harvest will occur such that 'less than one acre openings may be created on no more than 10 to 15% of the area in a stand.' Yet the location and impacts of these openings is never revealed or analyzed in the DEIS. Will these openings occur in the transient snow zone? Will these openings remove large trees or standing snags? What are the cumulative impacts of these openings on the (already impaired) hydrological health of the watershed? Where will these openings be located? How much timber volume will be removed via group selection harvesting?"

Response: This is a clarification of the FEIS. None of the action alternatives propose a group selection prescription; the only timber harvest prescription proposed is variable density thinning from below. To encourage the development of large individual trees and to retain special habitats (e.g. hardwoods or meadows) occasional "gaps" will be created in the stands. They would range in size between 0.25 and 0.5 acres in size, will represent up to 15% of the stand treated, and will not be treeless. A variety of stand conditions would exist but all would include a conifer or hardwood component. The density of overstory trees would however be significantly lower than the surrounding stand condition. An example of where an opening or "gap" would occur is on a DFPZ where large pines or Douglas fir are being favored; smaller trees would be removed from within the dripline plus 10" (FEIS Table 2-15), creating a more open stand around the large trees. Another example would be within dense pockets of white fir (trees ≤ 12") where trees would be variable thinned to produce small (0.25–0.5 acre) "gaps" over 15% of the area to encourage diversity and structure.

n. "Pacific Fisher. The discussion in the DEIS of the Pacific fisher is lacking. The USFWS warranted but precluded findings contain a detailed review on the conservation status of the fisher, including a comprehensive analysis of threats to the continued existence of the species...None of this scientific literature was discussed in the analysis of the proposed project."

Response: In their 12-month finding for a petition to list the west coast population segment of the fisher (*Martes pennanti*), the U. S. Fish and Wildlife Service recognized that timber harvest and fuels reduction treatments can destroy, alter, or fragment fisher habitat; habitat loss and fragmentation appear to be significant threats to the fisher; and that fisher avoid areas with little forest cover or significant human disturbance and prefer large areas of contiguous interior forest (USDI Fish and Wildlife Service 2004).

The current status of Pacific fisher, including its habitat requirements, activity patterns, prey, and threats, are discussed in the Project Wildlife Biological Assessment/Evaluation (Johnson 2007a) and the Wildlife Specialist Report and Addendum (Johnson 2007b, 2008), and summarized in the FEIS (Section 3.2.12). These documents incorporated the best and most recent scientific information available and provided the basis for analyzing the effects of the proposed alternatives to the Pacific fisher.

In summary, these assessments determined that the project would have insignificant effect to fisher denning and resting habitat (approximately 0.05% of extant habitat in the fisher analysis area would be removed) and would not measurably impact connectivity or create barriers to fisher movements. Thus, the project would not contribute to the significant threats of habitat loss and fragmentation identified by the USFWS (USDI Fish and Wildlife Service 2004) and is not expected to affect population viability.

o. "Hence we were very disappointed that the scant paragraph contained in the DEIS (3-167) in which impacts to visuals were "analyzed" made no mention whatsoever of the impacts of landings, "temporary" road construction or yarding corridors on the attainment of VQOs." [see complete comment in code 701, visual quality /enhancement]

Response: An expanded summary of the project Scenery Analysis is included in this FEIS, which identifies the achievement of Forest Plan Visual Quality Objectives. The Project Scenery Analysis (Mosier 2007a, 2007b) gave full consideration to the scenery effects of landings, road construction, yarding corridors and many other activities. The project established project scenery design standards to assure Visual Quality Objective achievement. To review how the project's Scenery Design Standards addressed landings, road construction and yarding corridors, refer to standards 5, 6 and 7 of Mosier (2007a, 13).

One respondent is concerned the DEIS does not disclose the positive or negative effects of logging practices spreading dwarf mistletoe.

p. "Logging spreads dwarf mistletoe…To really reduce mistletoe, further logging would be necessary after this entry; the DEIS fails to disclose that fact. Also, mistletoe seed production will increase with improved nutrition of the infected leave trees. More open stands will promote regeneration, and the new trees can become infected by the mistletoe seeds. Moreover, increased mortality can occur in the remaining overstory trees; some heavily infected trees are not able to adjust to release from competition (Knutson and Tinnin 1980). The DEIS fails to disclose this." [Also see Code 308, Mistletoe]

Response: Reduction, not elimination of mistletoe is an objective of the stand treatments in order to promote the development and maintenance of late-successional forest. The project will treat mistletoe infected trees during thinning. Modeling indicates that treatments will result in a dwarf mistletoe rating (DMR) less than 3 after 50 years (FEIS Section 3.1.4). In natural ecosystems, dwarf mistletoes have value as biological species and act as disturbance agents, influencing both the structure and function of forest communities. Management strategies should take into consideration the value of dwarf mistletoes as functional components of forest ecosystems in which they occur. The key to proper management of this parasitic plant is to recognize its importance in the overall diversity of ecosystems and to devise management alternatives that recognize and maintain that diversity while meeting management objectives (Taylor and

Mathiason 1999). The 6-class DMR system is useful for quantifying severity of infestation in trees and stands (FEIS Section 3.1.3).

When large harvest units are not desirable, such as in an LSR, thinning or sanitation by removal of infected trees can be an effective treatment in lightly infested stands. Lightly infested is defined as those stands in which there are acceptable numbers of desirable dwarf mistletoe-free or lightly infected trees (DMR 1 to 2). Pines with one-half or more of their crowns infected by dwarf mistletoe (DMR 3 to 6) may decline rapidly about 10 years after they are exposed to full sunlight by thinning. Because of their rapid decline, moderately infected trees (DMR 3 and 4) should not be left when stands are being sanitized. In overly dense stands, thinning can be used as a tool to increase growth and vigor of lightly infected trees and help them withstand mistletoe effects (Taylor and Mathiason 1999).

Based on research on mistletoe impacts to pine in the southwest, a DMR greater than 3 impacts the seed viability of pine species, resulting in stands with lowered ability to regenerate naturally (Landram pers. comm.). By managing to maintain a DMR below 3, the treatments are not eliminating the habitat structure that is important to wildlife species, such as the NSO, but are moderating the severity of the infection so that seeds are viable and trees can regenerate through time (ibid). Additionally the crowns of the residual trees will continue to expand, overtop and shade out the majority of newly spouted seedlings. Most of the trees being retained are 80–90 years old with the physical ability to respond with increased growth when competition is removed. Not all trees will respond, but those that do will add some vertical diversity to these stands, a desirable attribute.

q. "The DEIS (3-36) acknowledges that '[t]rees infected with mistletoe may be removed…' but the DEIS fails to quantify or analyze the impacts of mistletoe logging. A. You must disclose positive ecological benefits of dwarf mistletoe. The DEIS did not disclose the full benefits of dwarf mistletoe to a late-successional forest ecosystem. The fruit, foliage and pollen of dwarf mistletoe are a food source for numerous bird, mammalian and insect species. Dwarf mistletoe alters the growth patterns of infected trees, creating structural complexity within forests in the form of witches brooms and especially snags, both of which are used by numerous wildlife species (including spotted owls) for nesting, roosting and cover"

Response: As discussed above (see response to preceding comment p.), reduction, not elimination of mistletoe is an objective of the stand treatments. Mistletoe infection can create opportunities for wildlife habitat in the form of witches brooms, snags, and food. Geils and Hawksworth (2002) found that although dwarf mistletoes do not provide large incentives for birds or mammals to visit for pollination or seed dispersal as do other mistletoes, dwarf mistletoes provide forage, foraging sites, protected and special sites, and desirable stand structures for numerous wildlife species. However, he further determined that mistletoe presence, incidence, and severity may not be good indicators themselves of wildlife habitat value.

While mistletoe may provide some benefits to wildlife, it can also adversely affect tree health. Conklin (2000) notes "Over time, infection centers usually become more open, with lower crown cover and basal area than the surrounding forest. Productivity (tree growth) eventually becomes markedly reduced within these centers, and they may become dominated by stunted, deformed trees." As discussed above, the treatment objectives are to manage mistletoe so that wildlife habitat structures are not eliminated, but severity of the infestation is moderated (DMR less than 3; refer to FEIS Section 3.1.4). Features such as witches brooms will continue to occur throughout the area.

One respondent claims the following two references cited in the literature section do not appear within the main body of the DEIS, and a question arises as to whether important facts about the Townsend's big-eared bat got inadvertently left out of the DEIS.

r. "Fellers, G. M., E. D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (Corynorhinus townsedii) in coastal California. Journal of Mammalogy 83:167-177."

s. "Pierson, E. D., and G. M. Fellers. 1998. Distribution and ecology of the big-eared bat, Corynorhinus(=Plecotus) townsendii in California. Report prepared for the Department of the Interior, U.S. Geological Survey, Biological Resources Division, Species at Risk Program."

Response (to comments r. and s.): Correction to the FEIS: These two citations were used in the BA/BE to support the fact that structures used by Townsend's big-eared bats for roosting; large diameter trees, abandoned buildings, and bridges, occur in the Project Area. For the DEIS, much of the background information for species was omitted and these citations remained in the literature cited section inadvertently.

t. "Section 3.2.14, Pallid Bat and Townsend's Big-eared Bat, pages 3-57 through 3-58…The DEIS indicates that '[p]allid bats are very sensitive to disturbance at their maternity and hibernating roost sites. It is important that these sites remain undisturbed because these sites are essential for metabolic economy and juvenile growth (CDFG 1990).' The DEIS further states that 'Townsend's big-eared bats are extremely sensitive to disturbance at roost sites (Humphrey and Kuntz 1967) and may abandon a roost site following a single disturbance (CDFG 1990).' (page 3-57) However, the DEIS then goes on to say that '[t]hinning is expected to have long-term benefits for pallid and Townsend's big-eared bats by promoting the development of large-diameter trees which may provide suitable roosting sites.' The DEIS further contradicts itself by then stating '[p]ast management activities in the Project Area has likely impacted pallid and Townsend's big-eared bats by removing potential roost sites' and '[w]hile pre-commercial thinning will not remove habitat, this activity along with recreational activities have the potential to disturb roost sites.' (page 3-58) These statements seem to be contradictory regarding the effect of proposed action on both the pallid bats and Townsend's bigeared bats. The Department recommends that this effect be further analyzed in the FEIS and be revised, as appropriate."

Response: Thinning and fuels reduction treatments will likely have short-term adverse affects as well as long-term beneficial effects to pallid and Townsend's big-eared bats. The direct effects to pallid and Townsend's big-eared bats include disturbance of roost sites from thinning and fuels

reduction activities. This disturbance is only possible during project implementation. Thus, it represents a short-term impact. Because thinning and fuel reduction treatments are expected to promote the development of late-successional forest over time, the project is expected to have long-term benefits to these species by increasing the number of large diameter trees and snags suitable for roosting.

Past activities in the Project Area have likely removed an appreciable amount of pallid and Townsend's big-eared bat roost sites. However, suitable roost sites for these species, in the form of large diameter trees and snags, bridges, and buildings, remain scattered throughout the Project Area. Therefore, activities that occur adjacent to these sites have the potential to disturb roosting bats if they are present.

One respondent asks for the criteria used by the USFS in choosing sites for slashbuster treatment. A group of respondents call for more information on slashbuster treatments in the DEIS.

u. "Prioritization of Sites. We are curious how the Forest Service chooses the sites on which to implement the Slashbuster treatment…What criteria are currently being used to determine the location of proposed slashbuster treatments?"

Response: The Slashbuster is just one of a type or brand of masticating equipment. Masticators have been proposed as a tool to reduce ground and ladder fuels. When fuels conditions or stand conditions warrant the use of masticators as a tool to accomplish project objectives (mastication would effectively reduce fuels), the location for use within the project area is determined by process of elimination. That is, it is not used in places where unacceptable resource damage may occur. For example, the primary limitation is steepness of the area to be treated; the equipment is not used on slopes greater than 35%. Other considerations are: the amount of rock in soil (very rocky stands limit equipment operability); size of material to be treated [very large (> 12"diameter) and very young material (live limbs within a few inches at the ground) reduce the equipment's ability to adequately treat the vegetation]; and density of the residual stand (if stocking conditions post-treatment are tight (< 10' apart) it is difficult for equipment to operate in the stand and not damage leave trees). Conservation measures incorporated into project design also influence where masticators will be used. For example, talus habitat, suitable for salamanders or mollusks, or wet areas will not be treated with a masticator.

v. "Fire Behavior. Our organizations are very interested in learning about the impacts of slashbuster treatment on such 'fire variables' as residence time, short-term fuel loading, long term vegetative response, and microclimatic conditions on the site. Such information is simply absent from the DEIS."

Response: Effects of mastication, of which 'slashbuster' is a particular type of equipment application, are not well studied. However, some recent studies from the PSW Research Lab in Redding, California provide some insight to the issue of resident time and corresponding impacts.

In one study, soil moisture as low as 20% by volume was sufficient to quench soil heating and inhibit the progression of lethal soil temperatures below the surface inch (Busse et al. 2006). Since masticated fuel beds help to maintain elevated levels of soil moisture (mulching effect) a reasonable hypotheses is that soil moisture levels are high enough in natural stands with coupled residual canopy shading to prevent unacceptable lethal effects to soil biota. It is generally assumed that the masticated fuel beds will suppress existing and germinating herbaceous vegetation, but have little to no effect on existing trees and shrubs. Mastication will have a negative impact on germination of most tree and shrub species which typically germinate better in mineral soils. The depth of the masticated fuel beds are variably continuous in distribution depending on the existing vegetation to be masticated. Such a patchy mosaic helps to assure survival of herbaceous and germinating species in the short-term (<5 years) when masticated fuel beds have their greatest effects on these classes. Masticated fuel beds will also contribute to increased soil moisture during the growing season (mulch effect), thereby increasing growth potential in the short-term.

Decomposition of masticated fuels may increase CO2 production in the short-term due to the respiration of microorganisms as they break down the masticated material. Recent studies in nitrogen-fixing shrub communities showed significantly increased soil respiration when treated with thinning only and no significant increase with thinning followed by burning (Ma et al. 2004). The same study showed no significant increase in soil respiration for closed canopy and open canopy mixed conifer forests. It is thought that the nitrogen fixing properties of the shrubs affected soil respiration rates. In general, previous studies concluded that thinning increases soil temperature through increased insulation and increases soil moisture through decreased transpiration, both of which have a positive effect on soil respiration rates. The interactions of stem density, soil moisture, soil temperature, and soil respiration are complex and often have offsetting effects.

In the short-term available soil nitrogen can be expected to decrease as microorganisms use this resource to break down the residue. Flame lengths have been observed to be less in masticated fuel beds than in natural fuel beds. This is due to the compressed and moist nature of masticated fuel beds which limit oxygen availability for the fire. Thus, masticated fuel beds may serve to lower flame lengths and slow the rate of fire spread.

A few corrections or conflicting statements were pointed out by respondents.

w. "The DEIS states many times that the project area is approximately 30% under the desired level, which is 60-65%, for late-successional characteristics. This statement does not reflect statements found in the FLSRA. Page 2-98 of the FLRSA states that the eastern LSR's, including Mt. Ashland, "should be able to maintain 45-65% of the capable ground as late-successional at any one time." A true reflection of the current condition should state the Mt. Ashland LSR is currently 17% below the minimum desired range for

Late-Successional habitat and 37% below the maximum desired range. Treatments still need to occur in order to meet the long term desired range for this LSR but the situation is not as negative as stated in the DEIS."

Response: Please see response to comment 1.6k on p. 21.

x. "the DEIS (3-36) anticipates minimal cumulative impacts from this project on NSO habitat because 'a minimum of 60% canopy closure will be retained in existing nesting, roosting, or foraging habitat and 40% in dispersal habitat. Yet the modeled outcome for project thinning reduced canopy below 40% in every habitat type in the Project Area outside of the True Fir zone. (DEIS 3-18).'"

Response: Please see response to comment 1.6k on p. 21. As noted in the footnote (4) with the in Table 3-2 of the FEIS: "Canopy cover estimates are FVS model predictions based on a uniform treatment across stands. This estimate does not incorporate the untreated portion of stands (i.e., the >15% of each stand left untreated, the variable density of the thinning prescription, habitat retention areas, etc.) **Thus the FVS model underestimates average canopy cover post-treatment**" (emphasis added). The model is used as a tool for analysis and comparison of alternatives, it does not account for application of the prescription on the ground; the prescription will be implemented on the ground (by the marking crew) with oversight from the project silviculturalist and wildlife biologist to ensure the desired canopy closure is retained.

y. "Please note that while page 3-36 of the DEIS claims that 60% canopy will be retained in NSO NRF habitat and 40% in NSO dispersal habitat, the modeled post-project canopy range in the DEIS (3-84) is from 25% to 50% canopy cover. Which of these contentions is correct?"

Response: Post treatment**,** 60% canopy cover will be retained in nesting, roosting, or foraging habitat, and 40% canopy cover will be retained in dispersal habitat. These values differ from the Forest Vegetation Simulator (FVS) estimates because FVS can only model a uniform treatment across a stand. It can not model other prescriptions such as variable density thinning and it cannot incorporate habitat retention areas. Therefore, the FVS model underestimates average canopy closure post treatment.

As noted in the FEIS, 25–50% represents the possible range of conditions immediately after thinning without factoring in the within-stand variability, variable density treatments, and habitat retention areas. Thus the FVS model underestimates canopy cover post-treatment. Application of the prescription on the ground will be supervised by the project silviculturalist and wildlife biologist to ensure desired canopy cover is retained. It is important to remember that these mixed conifer types in the dry province of the NSO are extremely structurally heterogeneous at a fine mosaic (Spies et al. 2006) and these proposed treatments are not outside the natural range of variability or LRMP Standards and Guidelines for NSO habitat.

z. "The curious contention that '[n]one of the action alternatives will result in measurable impacts to recreation activities' is immediately belied by the contradictory statement that '[t]he operational impacts of the project such as traffic, noise, and dust will be temporary.' (DEIS 3-167). It should be obvious that 'temporary impacts' are in fact 'impacts.'...permanent visual impacts are in fact planned for the project area. The construction of landings is an irreversible (but unanalyzed) impact on visual quality and recreational values." [Also see summary for Codes 700 and 701]

Response: FEIS Recreation and Scenery effects sections have been revised to more completely summarize project effects (see also Mosier 2007b, 2007c). The Action Alternative effects are minor. Some scenery and recreation setting effects due to landings may be longer term, however, they would be limited in their magnitude and intensity by application of project's scenery design standards. These design standards are applied as needed to protect recreationally sensitive locations within the project area, and thereby achieve the Forest Plan's Visual Quality Objectives and Recreation Opportunity Spectrum classes.

1.9 CUMULATIVE EFFECTS ANALYSIS NEEDED (CODE 108)

Numerous respondents are concerned with the cumulative effects analysis in the Draft EIS. They say to "consider" cumulative effects, some quantified or detailed information is required. Without such information, neither the courts nor the public, in reviewing the USFS's decisions, can be assured that the agency provided the hard look that is required. Such a mandate is also consistent with the USFS's requirements under the National Forest Management Act. They contend the USFS fails to address past, present, and reasonably foreseeable future actions effecting resources (especially MIS) in the project area. They assert general statements about "possible" effects and "some risk" do not constitute a "hard look" absent a justification regarding why more definitive information cannot be provided. Some respondents also request more extensive cumulative effects analysis of site-specific impacts on the project's resources, particularly the watershed and riparian areas.

a. [EPA] "The EIS states that soil that leaves skid trails is unlikely to reach streams due to the filtering capacity of the riparian reserves. However, it does not discuss or evaluate the direct impacts these skid trails will have on streams associated with the addition and removal of fill and culverts. The EIS needs to discuss in detail the direct impacts associated with the construction and restoration of skid trails in riparian areas. In particular the EIS needs to evaluate the impacts from the addition and removal of fill and culverts used for skid trails in riparian areas."

Response: There will not be any fills made or culverts installed on skid trails for this project. No skid trails will cross streams in riparian reserves.

Neither perennial nor intermittent stream courses will be crossed by skid trails. Some skid trails may occur in Riparian Reserves, but not within 170' of streams. In a review of the ability of Riparian Reserves of different widths to buffer streams from adjacent disturbances, Broderson (1973) documented that riparian buffers of approximately one site potential tree height (170' on

each side of streams in this project) would be effective to remove sediment under most conditions. Some ephemeral dry swales may be crossed at designated points. These ephemeral swales carry only snowmelt, not surfaced groundwater. The flow in these features travels a short distance downstream, before infiltrating into the soil. Any designated crossing of these features will have the flow way re-established to prevent ponding.

b. "The location, and hence the site-specific impacts, of the 40 new landings discussed on page 3-134 of the DEIS are not revealed thus precluding informed analysis of the project's impacts."

Response: Potential landings were indicated on maps associated with the DEIS and were analyzed as part of the proposed action. Landing locations are also identified for the FEIS (refer to Appendix A) and were analyzed by all resources. The identified (mapped) landing locations are the best estimates of where landings will occur, some landing locations may need to be adjusted during layout and implementation in order to address feasibility and avoid resource impacts. These minor adjustments will be agreed upon by the sale administrator and the purchaser. The total number of acres identified for new landing construction are not expected to exceed acres identified in the FEIS (Section 2.2.2, 2.2.3, and 2.2.4). In some areas where cabling yarding will occur, trees will be yarded to the existing road using the road bed, existing wide-spots, or step landings (an existing terrace right below the road). In these situations, exact landing sites were not identified; instead the entire road was identified for potential landing sites (refer to Chapter 2 of the FEIS, description of alternatives).

c. [EPA] "EPA recognizes that providing high quality drinking water to protect human health is a high priority for land management agencies. Activities such as timber harvesting, and road building, may adversely affect waters that serve as sources of drinking water for communities. The EIS does not discuss whether there are source water protection areas within or downstream of the project area and whether the project will impact these areas."

Response: Municipal and domestic water intakes are considered as beneficial uses in the response to comment 1.8c on p. 26. Though there are no municipal intakes within the project area, there are domestic intakes downstream from the project area. Domestic water intakes are located outside of the project area generally in 1st and 2nd Order streamcourses.

d. [EPA] "The EIS needs to discuss the actions were taken to identify all federally-regulated and state regulated source water protection areas, within and downstream of the project area. If source water protection areas will be impacted by the proposed project, the EIS needs to discuss what those impacts may be and the measures that would be taken to protect them."

Response: Refer to response 1.8d on p. 27.

e. [EPA] "We have assigned a rating of EC-2 (Environmental Concerns - Insufficient Information) to all the alternatives presented in the EIS. This rating and a summary of our comments will be published in the Federal Register. We have concerns with the impacts from ground-based silviculture treatments, the impacts from the temporary road spurs that will be constructed and the cumulative watershed effects.

Additional information is needed on the impacts associated with the skid trails that will be constructed in riparian reserves and potential source water protection areas within and downstream of the project area."

Response: There are no source water protection areas, municipal or domestic water sources in the Project Area. Effects of ground-based yarding systems are thoroughly analyzed in Chapter 3 of the FEIS by resource. There will be no temporary spur road construction within Riparian Reserves. Skid trails associated with ground-based logging systems are not constructed. These yarding corridors are laid out on the ground and skidding equipment travel in these corridors. The effect of skidding equipment usage within these corridors depends on the volume of material removed and the number of turns or trips skidding equipment makes. The proposed project will generally remove trees less than 20" in diameter in a variable density thinning prescription (small material and low volume of material). Skid trails (corridors) will be laid out perpendicular to the Riparian Reserve to reduce the amount of ground disturbed within the Riparian Reserves (in the outer 170–340'). In addition, no timber harvest or skid trails will occur within 170' of streams.

Please see response to comment 1.9a on p. 37. Neither perennial nor intermittent stream courses will be crossed by skid trails. Some ephemeral dry swales may be crossed at designated points. These ephemeral swales carry only snowmelt, not surfaced groundwater. The flow in these features travels a short distance downstream, before infiltrating into the soil. Any designated crossing of these features will have the flow way re-established to prevent ponding.

The cumulative watershed effects are empirically analyzed in the Project Cumulative Watershed Effects Specialist Report (Elder 2006) and Addendum (Bousfield et al. 2008), and described in the Project Watershed Report (Snavely 2007a) and Addendum (Snavely 2008b), as well as the FEIS.

Cumulative Effects Analysis – Watershed and Riparian.

f. "While the agency does reveal the location of proposed road construction through riparian reserves (DEIS 3-28) the actual cumulative impacts of that construction are not disclosed and analyzed in the DEIS."

Response: A modification has been made to project description between the DEIS and FEIS based on public comment. There will be no temporary spur construction across streams within Riparian Reserves. Effects of Temporary road construction are included in the project Watershed Reports (Snavely 2007a, 2008b) and in the Project Cumulative Watershed Effects Specialist Report (Elder 2006; Bousfield et al. 2008). Fisheries impacts are discussed in the Fisheries Specialist Reports and BA (B. Thomas 2008, 2007a, 2007b).

g. "The DEIS (3-126) cursorily acknowledges that in the Beaver Creek Watershed there is currently a 'high road density,' that 'embeddedness is high,' due to 'large amounts of decomposed granitics present in the upper portions of this watershed and that the watershed,' and that the watershed is 'still recovering from the

1997 flood.' Yet the DEIS does not quantify and analyze these conditions in such a way as to reveal the cumulative impacts of the proposed actions in this impaired watershed."

Response: Road density in the Project Area is current high based on wildlife habitat capability models (FEIS Section 3.2.2). The project will reduce the open-road density in the Project Area (FEIS Table 3-4) thus reducing open-road density in the Beaver Creek Watershed. The project will result in a minor increase in total-road density during project operations and will result in a decrease in total-road density at the conclusion of the project due to decommissioning of both temporary spurs and a system road (FEIS Section 3.2.2).

The geology report states that storms and floods modified the channels of Beaver Creek and its tributaries in 1955, 1964, 1974, 1983, and 1997 (de la Fuente 2007, 9). The potential for future adverse cumulative watershed effects associated with past activities and future project actions were evaluated by means of the landslide model (GEO-model), and results are displayed in the FEIS in Section 3.4. The model results indicate a slight reduction in risk of adverse cumulative watershed effects as relates to landslides for the proposed action. The FEIS (3-136) also concludes that despite the large sediment influxes during the flood years, the channel and banks of Beaver/Grouse Creek are stable. Due to the influx of sediment in Grouse Creek from the flood of 1997, embeddedness is high and will take time to reach equilibrium with the system's ability to transport sediment (FEIS 3-126, B. Thomas pers. comm.). Stream surveys in 1999 and 2002 found stream temperatures averaged 17°C and are properly functioning for that factor (refer to the fisheries BA/BE, B. Thomas 2007b). These conclusions were derived from stream and fisheries surveys, since the landslide model does not relate directly to embeddedness or temperature. Road densities are a part of the ERA portion of the CWE analysis, embeddedness and potential increases are a part of the USLE and GEO portion of the CWE Report (Elder 2006) and the Addendum to the CWE Report (Bousfield et al. 2008). The modeled results show an insignificant increase is surface sediment risk and erosion which is not measurable in the field, therefore no sediment is expected to reach stream channels and embeddedness will not be affected (FEIS Section 3.4.3).

h. "Unfortunately, there is often insufficient data available to support limitations on the amount of basin harvesting that occur at any one time nor is there good evidence or an agreed upon procedure for determining what the magnitude of those limitations or thresholds should be. Other problems of current cumulative effects methodologies is their general emphasis on peak flows as the driving force behind downstream channel changes."

Response: The uncertainty in predicting the cumulative watershed effects of thinning is acknowledged in the Geology report (de la Fuente 2007, app. 7). By using the three model approach, (1) geo (landslides), (2) USLE (surface erosion), and (3) ERA, the KNF does not rely solely on peak flow. The ERA portion primarily addresses the approach of peak flow impacts, while the GEO and USLE portions of the model address sediment mobilization and influx.

i. "The Mt. Ashland DEIS doesn't show that the generic ERA/TOC method used throughout Region 5 fits the unique hydrological characteristics of this watershed. Its hydrology is distinct, given its largely granite composition and steep incised stream canyons which are most vulnerable to reductions in canopy closure and increases in soil compaction.

Response: As described in the response to comment 1.8a on p. 24, the R-5 generic ERA/TOC method would assign a Threshold of Concern (TOC) of 12% to all watersheds within the project area. This implies that 12% of the area could have disturbance before peak flow impacts may be starting to occur. The Klamath model allows each watershed to assign it's own TOC. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability of each watershed. Within the Project Area the TOC ranges from 6–8%.

The Klamath Forest is in the process of testing the validity of its cumulative watershed effects models in partnership with the University of California, Berkeley (de la Fuente 2007, 18). Some of the sample watersheds are tributaries to Beaver Creek. Initial findings indicate that the models successfully predict channel conditions in granitic watersheds with varying disturbance levels.

j. Furthermore, the ERA/TOC method is not transparent, and the DEIS doesn't disclose the data used by the Forest Service to reach the values assigned for watershed condition ratings or recovery thresholds. It's a "black box" that we can't see into or understand how it works. This is especially relevant given the large amount of direct ground disturbance that will occur as a result of ground-based logging (up to 1,202 acres) and landing construction (up to 25 acres), road construction (up to 6.86 miles) and given the significant cumulative effect of similar private lands activities on soil integrity, productivity, and hydrologic function."

Response: The process used to evaluate cumulative watershed effects is described fully in the Klamath Forest Cumulative Watershed Effects Analysis Process Paper (Elder and Reichert 2004), and in the geology, soils, and watershed reports for the Mt Ashland project. The Cumulative Watershed Effects Analysis Specialist Report (Elder 2006) shows in detail the effects of past logging history by logging system, ground disturbance, temporary or permanent roads, and landing construction, as well as the effects of road restoration activities. Please refer to response to comment 1.8a on p. 24 for more information.

k. "The DEIS repeatedly brushes off concerns about cumulative watershed effects in the impaired subwatershed from the action alternatives by raising the specter of a hypothetical high severity fire via the no action alternative."

Response: The term "impaired" is not part of our current KNF LRMP planning vocabulary, and "impaired watersheds" is not a term found in our Forest Plan. In order to be consistent with our planning documents, we use the term Areas With Watershed Concerns (AWWC) when referring to areas in that category as identified in the ROD. The term "impaired water bodies" will be used to refer to waters delineated as such by the State (Boland 2006).

Grouse Creek has been identified in the KLRMP ROD (1995) as an AWWC. As such, Forest direction calls for a "cautious approach" when implementing site disturbing activities (Boland 2006). For the Mt. Ashland LSR Habitat Restoration Project, a caution approach was taken by: designing a project that will improve forest health, implementing recommendations in the Beaver Creek Ecosystem Analysis, retaining large trees, maintaining canopy closure above 40% in habitat promotion stands, use of BMPs, establishment of riparian vegetation buffers, not allowing heavy equipment to operate within 170' of streams, limiting masticators and tractors to slopes less than 35%, minimizing spur road construction and not crossing Riparian Reserves with spurs. With the action alternatives there will be short-term, insignificant increases in sediment but the project will provide long-term benefits to the watershed (FEIS Section 3.4.3). With a no-timber-harvest or no action alternative, the long-term impacts from stand-replacing wildfire would include increases in potential peak flows, increased erosion, and the potential for significant increases in delivered sediment to stream channels (B. Thomas and Snavely 2007).

A model fire run in the upper Grouse Creek watershed was made to determine a "worst case scenario" were a high severity wildfire to occur with adoption of the No Action Alternative. The model used was the Watershed Erosion Prediction Project (Disturb WEPP) interface v.2006.01.20. The Fort Jones, CA climate model was used to simulate 30 years of climate. The one time use of the model is prudent given the drastic departure from the historic fire regimes.
WEPP was used to model the wildfire scenario for both the no action and action alternatives, it showed a 95% (.067 tons/acre compared to 1.26 tons/acre) increase in sediment produced under the no action wildfire scenario as compared to the action alternatives with wildfire (Snavely 2007a, 14). The wildfire scenario was also modeled with the CWE models (only for wildfire effects in treatment stands—not the entire burn perimeter) which showed 62% and 30% increases in modeled risk ratio for the USLE and GEO models respectively as compared to the Preferred Alternative (Bousfield et al. 2008).

The probability of high severity fire is supported by Fire Regime Condition Class analysis:

> Current (1910-2005) fire return intervals exceed historic averages: approximately 89% of the Mt Ashland LSR project area has not experienced a wildfire since 1910, and approximately 74% of the project area is characterized as severely departed (condition class III) and approximately 22% as moderately departed (Condition Class II) by the FRCC(FRI) measure.

Studies in the northern Sierra Nevada mixed conifer zone, which is very similar to the Mt. Ashland mixed conifer fire regime and more so than the mixed-evergreen zone reported by Odion et al. (2004), showed high positive correlation between length of time without fire and fire severity (Safford pers. comm.).

l. "Practices such as felling, ground-based yarding, roading and landing construction occur on relatively small units. These activities lead to changes in site processes such as increases in snow accumulation, snow melt rate, surface erosion, and landsliding. During a single large flood event, these individual alterations collectively may lead to substantial increases in streamflow and erosion downstream. Other types of basin cumulative effects include changes in water temperature, and stream chemistry."

Response: The cumulative effects of incremental actions were considered in the cumulative watershed effects analysis in the FEIS (Section 3.4.1 through 3.4.3), in the Cumulative Watershed Effects Specialist Reports (Elder 2006; Bousfield et al. 2008), and in the Watershed Reports (Snavely 2007a, 2008b). Neither the EIS nor the Watershed Report indicate a high level of risk for a rain-on-snow event. The probability of a rain-on-snow event is determined by climatic and weather patterns. The response of each watershed to such an event varies according to its condition. The Mt. Ashland LSR Project action alternatives include variable density and small diameter thinning prescriptions; using these prescriptions, forest cover will be retained. Soil may be displaced during yarding operations, temporary spur construction or landing construction and the effects of those actions have been analyzed in the FEIS on Section 3.5.3. Most of the units under these prescriptions are located above the Transient Snow Zone. Under any alternative, Grouse and Long John Creeks have the highest potential for short-term adverse effects to beneficial uses due to increased turbidity during a rain-on-snow event that affects openings within the Transient Snow Zone.

In the event of a stand-replacing wildfire, impacts to water quality under the No Action Alternative will be severe. This was shown by the use of the WEPP model (Snavely 2007a) and the CWE model (Bousfield et al. 2008). In the event of a wildfire, significant canopy loss and reduced soil infiltration can increase erosion and runoff rates, increase sediment delivery, and result in an increase in peak flows and landslide risk. Increased erosion following stand-replacing wildfire could change the current occasional brief periods of sedimentation and turbidity to prolonged chronic periods, resulting in increased erosion and adverse impacts to fish habitat.

Overall, the project will result in insignificant short-term effects, and will result in long-term watershed benefits from road decommissioning and reduction in the risk of stand-replacing wildfire. The action alternatives differ in the level of long-term watershed benefits generated.

m. "Besechta et al. (1995) also identified several conditions precedent for accurate analysis of cumulative watershed effects, including: 1) accurate understandings of natural variation in environment; 2)reliable baseline information at the local and regional scale (ideally from "reference" sites); 3) accurate assessments of the probable effects on key resources of past, present and foreseeable future activities; 4) development of reliable models that relate resource conditions within a dynamic spatial framework; and 5) establishment of levels of acceptable change in the environment."

Response: The model used in KNF CWE analyses allows users to assign TOCs by watershed. The KNF has iteratively modified the R-5 generic model for cumulative effects analysis using up to date information and disturbance coefficients that have been field verified through monitoring. Disturbance recovery and road restoration coefficients are also recalibrated regularly.

The three model approach used by the KNF in evaluating cumulative watershed effects has been tempered by field observations by experienced watershed personnel addresses all of Besechta's five points:

1. Klamath Forest watershed personnel each have more than 25 years of practical field experience in the Klamath Mountains. This provides a sound basis for understanding the natural variations of the environment;

2. Baseline information is available from stream and fisheries inventories as well as landslide and soil erosion inventories across the KNF, and also in the Beaver Creek watershed. This information was used in developing CWE models.

3. The probable effects on key resources of the types of activities proposed by the Mt Ashland LSR project (as related to landsliding) have been evaluated and quantified by Klamath Forest geologists in several studies (de la Fuente Haessig 1994; de la Fuente and Elder 1997; de la Fuente et al. 2006). Findings from these studies has been brought forth and applied to the assessment of cumulative effects for the Mount Ashland LSR Project. Similar work by Forest soils and hydrology personnel have also been utilized in the USLE and ERA models respectively. Past present and foreseeable activities have been accounted for in the analyses and are included in Appendix B of the FEIS and in the CWE Report (Elder 2006).

4. Models used by the Klamath Forest are being tested for reliability now (see Cover et al. 2006), and are set in a dynamic spatial framework (activities are tracked spatially across the watershed over time).

5. Inference points are used as indicators of potential for adverse cumulative watershed effects.

n. "There are a number of site-specific actions proposed in the DEIS that may result in significant adverse cumulative impacts within this AWWC. The DEIS (2-28) calls for use of mechanical mastication on slopes up to 45% and calls for allowing mechanical slashbusting within designated riparian reserves (DEIS 2-23). The DEIS fails to point to any literature or studies indicating that mechanical mastication is appropriate on slopes in the 35–45% range in this highly impacted, and highly erosive, watershed."

Response: Changes have been made in the project description as a result of public input. Slope limit for mechanical mastication operation has been changed to a maximum of 35%. This is illustrated in Section 1.3 of the FEIS.

There will be no mechanized equipment within 170' of streams. The analysis in the FEIS has identified the insignificant short-term effects and long-term beneficial effects of the proposed project. Cumulative effects analyses can be found in Chapter 3 of the FEIS

o. "The DEIS (2-23) acknowledges that: (1) skid trials and skyline corridors will cross riparian areas; and that (2) fill may be added to riparian features to facilitate such yarding activities. Yet the site-specific locations and impacts of yarding through, and placing fill in, riparian reserves is not disclosed or analyzed in the DEIS. Indeed, the public and the decision maker are precluded from knowing the location, frequency, or impact of these activities."

Response: Changes and clarifications have been made between the DEIS and FEIS. There will be no fills made on any skid trails for this project. There will be no crossing of streams in riparian reserves by skid trails. Skyline corridors will use full suspension when crossing streams and riparian reserves.

There will be no timber harvest within Riparian Reserves in the first 170'. Thinning may occur in the upland in the outer 170–340' of Riparian Reserves on less than 1% of the project area; there will be no equipment in riparian areas (wet areas), riparian vegetation, or inner gorges. In some treatment stands, ephemeral draws (or summer-dry swales that transport snow melt) may be encountered that were not previously known or mapped in GIS. These ephemeral swales carry only snowmelt, not surfaced groundwater and are not classified as Riparian Reserves. If logs need to be skidded across these draws, skid areas will be designated by the sale administrator to avoid riparian vegetation and to minimize potential effects. Rarely would fill material or logs be used to facilitate yarding across an ephemeral draw because those situations are avoided unless skidding across a draw would result in less impact that going around the draw. The locations where these situations may occur are not known until stands are marked or during implementation, and therefore it is not feasible to disclose specific locations in the EIS. In general, based on past experience (Blessing pers. comm.; Holmes pers. comm.), skidding across draws is a rare event and impacts are insignificant when considered at the project scale (Snavely 2007a). Rehabilitation of skid trails or corridors may occur as discussed in the Conservation Measures for Soil.

Cable yarding systems may be set up across Riparian Reserves or creeks depending on the capability of the yarder being used. In these situations, the purchaser will identify needed cable corridors for approval by the sale administrator. In general, tying off across a stream is a method used to increase deflection for cable yarding; logs are not usually carried over the Riparian Reserve, only the carriage or the mainline cable cross the creek. Increased deflection results in higher suspension of logs and the ability to negotiate small ridges or flat areas.

p. "DEIS 3-68. The BMPs for this project do not contain a site-specific cumulative impact analysis of the impacts of road construction in the riparian reserves. It is highly likely, to the point of certainty, that yarding activities, road construction activities, and hazard tree felling, will indeed fell trees larger than 9" DBH in the riparian reserves…"

Response: BMPs are not used to conduct cumulative effects analysis. BMPs are measures that are included in the project to minimize erosion stemming from individual actions, thereby minimizing direct and indirect effects, and therefore cumulative effects of the actions. Yarding activities will occur in the outer 170' of riparian reserves as discussed in the Response to Comment 1.9o. Only trees <9" DBH will be felled within the first site potential tree height in Riparian Reserves (in this case this is within the first 170') as part of fuels reduction treatments. There will be no temporary road construction across streams within Riparian Reserves. Temporary spur road T401 is proposed within a Riparian Reserve parallel to a stream in Alternatives 2 and 4 but will not cross the stream. There is no road construction in Riparian Reserves under Alternative 5 and the Preferred Alternative. Felling of trees greater than 9" DBH may occur as a result of hazard tree abatement along haul routes or during construction of T401. Felling hazard trees will provide for safety on USFS roads, consistent with the requirements of the Federal Highway Safety Act and the Occupational Safety and Health Administration regulations. Hazard trees will be identified using the Klamath Hazard Tree Guidance (USDA Forest Service 2001a).

q. "On page 3-139 (and 3-25, 3-28) of the DEIS the agency proposes constructing two spur roads within riparian reserves (and across the riparian features) and acknowledges (but does not analyze the impacts of) the construction of skyline corridors and skid trails within riparian reserves. Please note that the location, frequency and impacts of skyline corridors and skid trails within riparian reserves is not disclosed in the DEIS."

Response: Please see responses to comments 1.9o and 1.9p and pp. 45 and 46 respectively.
There will be no temporary spur road construction across streams or riparian areas. There will be no temporary spur construction in Riparian Reserves under the Preferred Alternative or Alternative 5. There is a temporary spur proposed in Alternatives 2 and 4 which is within a Riparian Reserve but runs parallel to the stream and does not cross it.

Cumulative Effects Analysis – Wildlife.

r. "Throughout the Wildlife BA/BE, EIS and ROD, the Forest Service makes conclusory statements regarding the cumulative effects on the threatened, sensitive, and management indicator species not based on adequate quantitative data. The Forest Service fails to address past, present, and reasonably foreseeable future actions effecting MIS in the project area. The USFS fails to substantively address the cumulative watershed effects of all actions in the affected watersheds and the impact on MIS and instead discounts cumulative impacts as individually minor impacts without examining their collective significance."

Response: The Project BA/BE (pp. 18–55) and the Project Wildlife report (Johnson 2007) addressed cumulative effects for all Federally listed, USFS Region 5 sensitive species, and MIS expected to occur in the Project Area. Because project actions are not expected to affect many of these species, there were no cumulative effects for project activities combined with other actions. For the remaining species, a description of past actions that impacted habitat, or a summary of past actions when specific information was not available, was discussed. This information was then incorporated into the species baseline. The best available information on reasonably foreseeable future actions and their expected impacts were also disclosed. When the reasonably foreseeable future actions were expected to impact a species, the effects of these impacts were considered cumulatively. Note that the ROD had not been completed when this comment was received.

s. "The DEIS and MIS assessment for the Mt. Ashland LSR timber sale not only fails to provide monitoring information for all MIS species, but also fails to adequately analyze impacts to the black bear, American marten, Pacific fisher and Wolverine. Cumulative and direct impacts to pallid and Townsend's big-eared bats are not fully disclosed and analyzed. Population treads for these species were not disclosed."

Response: Please refer to response to comment 1.1g on p. 10. Impacts to black bear, American marten, Pacific fisher, wolverine, pallid bats and Townsend's big-eared bats were analyzed in the Wildlife Specialist Report (Johnson 2007) and in the FEIS in Sections 3.2.27, 3.2.13, 3.2.12, 3.2.11, and 3.2.14 respectively.

t. "the DEIS (3-36) anticipates minimal cumulative impacts from this project on NSO habitat because "a minimum of 60% canopy closure will be retained in existing nesting, roosting, or foraging habitat and 40% in dispersal habitat. Yet the modeled outcome for project thinning reduced canopy below 40% in every habitat type in the Project Area outside of the True Fir zone. (DEIS 3-18)."

Response: Please see response to comment 1.8x on p. 36.

Cumulative Effects Analysis – Fish.

u. "The analysis contained in Cuddy Mountain is quite similar to the KNF's summary dismissal of cumulative effects to anadromous fish in the DEIS."

Response: Cumulative effects to anadromous fish are disclosed in the FEIS Section 3.4.3. Past, present, and reasonably foreseeable actions have been considered in this analysis. The analysis of effects on fish habitat relies on the CWE analysis found in Elder 2006, Bousfield et al. 2008, Snavely 2007a and Snavely 2008b. Please refer to Appendix B for lists of actions considered in cumulative effects.

v. "However useful site specific BMPs are in minimizing effects of individual actions, they still do not address the cumulative effects of multiple actions occurring in the watershed which, though individually

"minimized" through application of site-specific BMPs, may still be significant, in their totality, and have undesirable consequences for beneficial uses such as salmon populations and salmon habitat."

Response: Please refer to response to comment 1.1d on p. 7.

Cumulative Effects Methodologies Used for Analysis

w. "Unfortunately, there is often insufficient data available to support limitations on the amount of basin harvesting that occur at any one time nor is there good evidence or an agreed upon procedure for determining what the magnitude of those limitations or thresholds should be. Other problems of current cumulative effects methodologies is their general emphasis on peak flows as the driving force behind downstream channel changes."

Response: Please see response to comment 1.9h on p. 40.

x. "There are several Timber Harvest Plans (THPs) in close proximity to the proposed logging and their impacts will be cumulative on wildlife habitat and the hydrological health of the Beaver Creek watershed and they must be considered together under NEPA. 40 CFR §1508.27(b)(7). Additionally, the USFS is planning the Ashland Forest Resiliency (AFR) timber sale in the same LSR. AFR will occur within the same NSO home ranges as the Mt. Ashland DEIS."

Response: Please see response to comment 1.5b on p. 16

For a discussion of wildlife cumulative effects analysis please see response to comment 1.9r on p. 46.

y. "It is not enough for environmental impact analyses to make general observations about past and future harvest. Analysis of specific timber sales located near each other and a comprehensive evaluation of the environmental effects of these sales when added together must be performed in an EIS."

Response: The Cumulative Watershed Effects Analysis Report analyzes all past timber harvest actions on public lands. There are on-going, multi-year timber harvest operations occurring on private lands within the Project action area. The effects of these actions on private lands are also accounted for in the CWE Analysis report. Where appropriate, past harvest effects are included in baseline information used in analysis. Analyses involved much more rigor than "general observations." Please refer to analysis methods and environmental consequences sections in Section 3 of the FEIS.

z. "In addition to failing to fully consider and disclose the impacts of private timber sales in the watershed, the Mt. Ashland DEIS fails to fully account for the effects of logging and road-building over time and space within the planning area and across the larger landscape."

Response: Cumulative effects analyses can be found in the FEIS through out Chapter 3 for all of the resource analyses. A list of all private timber sales considered in the analysis are given in Appendix B and in the CWE report (Elder 2006) Impacts on water quality and fisheries are

discussed at length in the FEIS in Section 3.4.3 and discuss the effects of thinning and temporary spur road construction specifically. The cumulative watershed effects analysis does not indicate that there will be significant cumulative effects resulting from implementation of any action alternative. Any sediment generated by landslides would be delivered in a short-lived pulse, most probably occurring in the winter when it is masked by background levels. The analysis concludes "The small amount of sediment generated by the action alternatives will not be measurable at any one site, and will be intercepted by riparian reserves before it could enter stream channels. Effects are negligible. The risk for increasing cumulative effects with any action alternative is very low to low." (Section 3.4.3) Watershed effects under the Action Alternatives are predicted to be significantly less than those expected in the No Action alternative under the wildfire scenario.

Please refer to response to comment 1.9r on p. 46 for a discussion of wildlife cumulative effects analysis.

aa. "The DEIS (3-20) acknowledges that group selection harvest will occur such that "less than one acre openings may be created on no more than 10 to 15% of the area in a stand." Yet the location and impacts of these openings is never revealed or analyzed in the DEIS. Will these openings occur in the transient snow zone? Will these openings remove large trees or standing snags? What are the cumulative impacts of these openings on the (already impaired) hydrological health of the watershed? Where will these openings be located? How much timber volume will be removed via group selection harvesting?"

Response: There will be no group selection harvesting taking place in this project. Please refer to response to comment 1.8m on p. 30.

bb. "the Ninth Circuit rejected the cumulative impacts analysis in an EIS because it referred in general terms to "development projects" and 'ongoing urbanization' rather than identifying these projects and their impacts. Carmel by the Sea v. US Dept. of Transportation...For the Mt. Ashland LSR and AWWC logging project, the Forest Service's failure is even greater. It is not a diffuse 'ongoing urbanization' that is impacting the listed species in the watershed; Rather here we see a series of timber sale projects are being implemented that result in cumulative impacts to a single LSR. NEPA requires disclosure of the cumulative impacts from these timber sales."

Response: Please refer to responses to comments 1.1a and 1.5c on pp. 5 and 17, respectively.

Reliance on Best Management Practices to meet the Clean Water Act.

cc. "Given the significant cumulative watershed impacts…, our organizations were very surprised to see that the Mt. Ashland DEIS relies solely on implementation of vague and generic Best Management Practices (BMPs) to meet the substantive requirements of both the CWA and the Basin Plan. This concerns us greatly.

Response: Please refer to response to comment 1.1e on p. 8. The BMPs are neither vague nor generic. The implementation measures for each BMP identify specific situations and procedures for their use. Monitored BMPs since 2002 on the Forest have an average implementation success

rate of 91% and an effectiveness success rate of 97%. The 97% BMP effectiveness rate is a better measure of actual BMP implementation.

dd. The USFS should be aware that the National Marine Fisheries Service (NMFS) criticizes the use of Best Management Practices (BMPs) and mitigation as poor surrogates for addressing cumulative watershed effects because BMPs are addressed to individual actions and fail to limit the totality of individual actions within a watershed."

Response: The National Marine Fisheries Service and the USFS consulted on the list of BMPs for this project and reached an agreed-upon list of project specific BMPs. The list of BMPs is included in the FEIS in Appendix D.

Please refer to responses to comments 1.1c, 1.1d, and 1.1e, starting on p. 7.

ee. "The KNF's contention that applying a BMP while conducting a specific forest practice minimizes site specific effects and thus also minimizes cumulative effects is logically flawed. Every BMP is an action and has an effect and hence the more the BMPs are applied the greater the cumulative effect. Only by minimizing the number of actions, i.e., the number of individual applications of BMPs, would cumulative effects by minimized. This is precisely why a cumulative effects assessment is needed – to establish the watershed-specific limits and excesses of BMP applications."

Response: Please refer to responses to comments 1.1c, 1.1d, and 1.1e, starting on p. 7.

2. COMMENTS ON ALTERNATIVES

Public comments on Alternatives 1, 2, 4, and 5 are presented in this portion of the report. The majority of comments received on the Draft EIS addressed issues rather than specific alternatives. A description of each alternative is presented at the beginning of each alternative discussion to remind the reader of the alternative's key points.

Some respondents commented on alternatives previously considered but eliminated, provided suggestions on additional alternatives, or suggested possible combinations of portions of alternatives. These suggestions follow the discussions of Alternatives 1, 2, 4, and 5.

The following summary of Alternatives represents specific quotes from respondents. In order to protect the integrity of the individual responses, the quotes are used as closely as possible, including syntax mistakes, grammatical errors, and some misinterpretation of the data.

2.1 THE ALTERNATIVE DEVELOPMENT PROCESS (CODE 200)

In their letter, the Environmental Protection Agency (EPA) assigned a rating of EC-2 (Environmental Concerns-Insufficient Information) to all the alternatives presented in the EIS. The EPA review identified environmental impacts that should be avoided in order to fully protect the environment. The EPA calls for corrective measures requiring changes to the preferred alternative or application of mitigation measures that can reduce those impacts.

a. "We have assigned a rating of EC-2 (Environmental Concerns - Insufficient Information) to all the alternatives presented in the EIS. This rating and a summary of our comments will be published in the Federal Register. We have concerns with the impacts from ground-based silviculture treatments, the impacts from the temporary road spurs that will be constructed and the cumulative watershed effects. Additional information is needed on the impacts associated with the skid trails that will be constructed in riparian reserves and potential source water protection areas within and downstream of the project area."

Response: Please refer to response to comment 1.9e on p. 38.

The EPA is also concerned that the action alternatives will have varying degrees of watershed effects due to the amount of treated acres, acres treated with ground-based equipment and the number of temporary spur roads constructed. The EPA recommends that the USFS select Alternative 5 to minimize the cumulative watershed effects in the project area.

b. "The proposed action alternatives will have varying degrees of cumulative watershed effects due to the amount of treated acres, acres treated with ground-based equipment and the number of temporary spur roads constructed. Alternatives 4 and 5 were designed to respond to some of the significant cumulative watershed effects. All the proposed action alternatives are consistent with Aquatic Conservation Strategy

(ACS) objectives such as maintaining water quality, retaining large trees and snags and the retention of coarse woody debris. The Klamath National Forest (KNF) Beaver Creek Ecosystem analysis also recommends reductions in road density and fuels within watersheds. Only Alternative 5 meets both the ACS and KNF Beaver Creek Ecosystem analysis objectives and recommendations, and consequently will have the fewest cumulative watershed effects. We recommend that the Forest Service select Alternative 5 for implementation to minimize the cumulative watershed effects in the project area."

Response: All of the action alternatives were designed to meet both the ACS and KNF Beaver Creek Ecosystem analysis objectives and recommendations. The Preferred Alternative, which was developed between DEIS and FEIS in response to public input, also meets ACS and Beaver Creek Ecosystem analysis objectives and recommendations. The Preferred Alternative has a lower modeled watershed risk ratio for the ERA and GEO models than the other action alternatives. It has an insignificantly higher risk ratio (.02) for the USLE model due to the addition of 1,297 acres of underburning as a fuels treatment. The cumulative watershed effects of the Preferred Alternative are displayed in Section 3.4 of the FEIS.

A few respondents commented on helicopter harvesting and landings proposed in Alternatives 2 to 5. They are concerned that whenever helicopter harvesting is proposed that the landings be within ¼ mile of harvest units in order to reduce significant flight costs.

c. "Wherever helicopter harvesting is proposed it is essential that helicopter landings be within ¼ mile from harvest units in order to reduce significant flight costs. The number of proposed helicopter landings did not increase from Alternative #2 to #5 even though Alternative #5 has a significant increase in helicopter acres. This would lead me to think much of the increased acreage would have flight distances greater that ¼ mile. I'm not sure if the Forest evaluated the need for helicopter service landings. This would lead to an increase in land impacts than what is assessed in the current document."

Response: During development of the Proposed Action, landings were proposed in as many locations as deemed necessary and possible without major construction (cut and fill, removing large trees). Four helicopter service landings were proposed. Landings were identified using aerial photographs, topographic maps and some field verification. Proposed landings included existing landings, wide areas along existing roads, and the expectation that existing roadbeds would be used as landings for cable yarding. Some helicopter landings are more than ¼ mile from stands that would be yarded by helicopter; landings were identified in all action alternatives to allow flexibility in flight path and provide feasible options for helicopter yarding (Bailey pers. comm.). Landings were located in areas where disturbance would be minimal and they would be central to clusters of treatment stands.

During the summer of 2007, the ID Team conducted field verification and reconnaissance of landings in response to public comment on the DEIS. In doing so, it was determined that there are up to 35 existing landings that may be used in the Project Area, including existing helicopter landings, service landings and biomass landings. In addition, it was determined that up to 41

landings (22 acres) may need to be constructed to address yarding feasibility; these landings are included in the Preferred Alternative and are indicated on maps in Appendix A of the FEIS. For the most part, new landings are existing wide areas along roads or are areas where landing expansion or construction (e.g., tree removal) would be minimal. Within reason, landing designation is at the discretion of the purchaser after approval by the USFS Sale Administrator and may need to be adjusted to accommodate different types or sizes of equipment. Although most of the potential landing locations have been identified, it is expected that the Sale Administrator and the Purchaser may need to designate additional area to accommodate specific equipment and/or flight capacity. The effects of minor adjustments in landing size or location are not expected to exceed that which has been analyzed as part of the project.

d. "I have concerns about the economical viability of this project. You are proposing to harvest small diameter material, low volume per acre, and lesser valued species by utilizing very expensive harvest systems. All three treatment alternatives contain a significant amount of helicopter logging. The economic viability of this project needs to be considered carefully if the Forest is serious about implementing the project and achieving the long term desired conditions for the LSR."

Response: The purpose and need for the Mt. Ashland Project is to restore and promote late-successional forest habitat and to reduce fuels. Prescriptions have been designed to meet the objectives of the project and include removal of small diameter material to reduce fuels, thinning from below to allow the remaining larger trees to grow, removal of white fir where it has encroached into pine stands, and to maintain existing NSO habitat where it occurs. Although timber harvest has been identified as a tool to remove trees, it is not the main objective of the project. It is expected that timber harvest will generate revenue and will off-set the costs of the project but, in order to meet project objectives, more expensive yarding options will be considered. Yarding systems were identified to take advantage of the existing road system, minimize spur construction and minimize environmental effects to the extent possible. Ground-based systems will be used where feasible to minimize yarding costs but where access or environmental effects preclude ground-based yarding, helicopter yarding will be considered.

The Preferred Alternative addresses this issue. In response to public comment, the ID Team conducted field verification and layout of stands where cable yarding is proposed adjacent to stands identified for helicopter yarding. Consultants and contractors were brought in to determine how much helicopter yarding could be converted to cable yarding using longer reaches and/or intermediate supports. This alternative also resulted in much less spur road construction, thereby converting some tractor yarding to cable. Although the resultant alternative treats fewer acres than Alternatives 2 and 5, it meets the purpose and need as well or better than those Alternatives (refer to Table 2-6, Comparison of Alternatives) while at the same time minimizing helicopter yarding and spur road construction. With the Preferred Alternative, the effects of spur road

construction and ground-based yarding are minimized and more acres are proposed for cable yarding which is more economical than helicopter yarding.

Several respondents are concerned that the action alternatives will increase the risk of peak flows, surface erosion and landslides in the AWWC and fail to address the cause of the watershed impairment. Numerous respondents claim the Beaver Creek watershed in particular is impacted by far too many roads causing sedimentation and erosion. Other people feel the USFS needs to take a more cautionary approach with respect to future land management activities in order to achieve watershed recovery.

e. "...none of the action alternatives address the cause of the problem, and in fact, all of the action alternatives call for creating more canopy openings (via road construction, landing construction and group selection logging), logging more large trees (in the DFPZ and for road and landing construction), constructing temporary roads in impaired watersheds and continuing a policy of full fire suppression. Hence the action alternatives all increase the risk of peak flows, surface erosion and landslides in the AWWC and fail to address the cause of the watershed impairment."

Response: Please refer to response to comment 1.9l on p. 43.

The two main objectives from the purpose and need are to (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-succession forest related species. Although the project will result in long-term benefits to the watershed, watershed restoration, or addressing the cause of watershed impairment, was not part of the Purpose and Need.

The proposed treatments include variable density thinning to promote development of late-successional forest characteristics and to create DFPZs. The effects of thinning will include reduced canopy closure but large openings will not be created. Group selection prescription is not proposed in this project. Large trees are retained as part of the proposed thinning prescriptions. Minor openings will be created by construction of spur roads and landings; effects of spur and landing construction are discussed in Chapter 3 of the FEIS.

It is unlikely that the project proposal will increase landslide potential. Landings and temporary road locations have been reviewed in the field by the project geologist and hydrologist. The proposed roads avoid unstable areas, and would be built to the standards described in the Geologic Resource Protection Measures (de la Fuente 2007, 6). Similarly, any created openings would be laid out to avoid unstable areas, (de la Fuente 2007, 7). The potential effects of thinning on landslide rates are described in the geology report (de la Fuente 2007, Appendix 7, 53; 2008) and accelerated landsliding is not anticipated in response to thinning.

Soil disturbance, which exposes soil to erosional forces, results in increased soil movement. How far the soil moves is highly dependent on the amount of soil cover in the disturbed area, and cover

in riparian areas and hydrologic connectivity to a stream channel. Project design measures and BMPs are all designed to minimize the amount of soil reaching a stream channel. The primary benefit to the soil resource from this project is to reduce the detrimental effects of a wildfire on the soil resource. A wildfire under the No Action Alternative would likely cause more impacts to the soil resource than the action alternatives (see FEIS Section 3.5.2).

f. "The Beaver Creek watershed is already impacted by far too many roads that are bleeding sediment into the Creek with each rain, and the soils in this region are extremely vulnerable to erosion. The Forest Service's own staff have identified other means to achieve the desired thinning and fuels reduction without offsetting those benefits through the most destructive impact on watersheds in the west, namely road building."

Response: The FEIS acknowledges and considers the high road density in the Beaver Creek 5th Field watershed, it also describes and incorporates effects of the chronic sediment sources associated with the road system into analyses. The action alternatives consider varying levels of spur road construction ranging from 6.86 miles (Alternative 2) to 1.7 miles (Preferred Alternative). The effects of spur road construction on the watershed are discussed in the FEIS in Chapter 3. Overall, the short-term effects on the watershed are negligible and long-term effects are beneficial. An action alternative was developed with no spur construction (Alternative 3) but it was eliminated from further study because the effects between it and the other action alternatives were undetectable and the cost was significantly higher.

g. "The Klamath Forest Plan ROD directs that a cautious approach be taken with respect to future land management activities in AWWCs and that these 'activities be tailored to achieve watershed recovery.' We do not think that the agency is applying a 'cautious approach'…when it proposes logging and yarding techniques that raise the risk ratios for cumulative watershed effects in every single action alternative developed in the DEIS."

Response: Please refer to response to comment 1.6j on p. 20.

2.2 ALTERNATIVE 1: NO ACTION (CODE 201)

Alternative 1: As required by NEPA and the HFRA, this alternative is included and analyzed as an option to implementing any of the action alternatives and as a baseline against which the action alternatives can be compared. It is also included in order to analyze the potential impacts of not implementing the proposed habitat restoration and fuels treatments. With the No Action Alternative, no silvicultural treatments and no fuels reduction activities would be implemented to accomplish project objectives. Stand conditions and fuel levels existing in the Project Area will not be altered and processes affecting conditions will continue. The appropriate response for a wildland fire would continue to be suppression.

Only one comment directly addressed Alternative 1 and questions the conclusions regarding effects of the no action alternative.

a. "The EIS should fully address the potential for reduced canopy closure to increased solar radiation, ground level wind speed, surface fuel moisture and flammability to result from proposed density management. The DEIS (3-90) did acknowledge that '[d]ense canopies may contribute to crown fire spread but also reduce the amount of wind reaching the surface and may contribute to an increase in fine fuel moisture due to the shaded conditions.' Yet these findings are not reflected in bulk of the conclusions presented regarding effects of the no action alternative."

Response: Although the effects of canopy reduction on solar insulation, ground-level wind speeds, and surface fuel moistures and flammability are generally known to be positive, it is the cumulative effects on fire behavior that is of ultimate importance. Research supports the contention that reducing canopy bulk density and ladder fuels, components of canopy cover, has a positive effect on reducing fire severity (Ritchie et al. 2007; Fule et al. 2001).

2.3 ALTERNATIVE 2: PROPOSED ACTION (CODE 202)

Alternative 2 – Proposed Action: Alternative 2 was designed to meet the purpose and need for action. It will treat 4,706 acres in 256 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,589 acres and small diameter thinning for trees <9" on 408 acres. Defensible fuel profile zones would be created by using variable density thinning on trees >9" on 1,286 acres. Ground-based yarding systems would be used on 1,202 acres and helicopter yarding would be used on 1,071 acres. Underburning would occur on 1,502 acres and mastication would occur on 809 acres. Thinning of small trees and burning would occur on 303 acres within Riparian Reserves. Spur road construction would include 6.86 miles of new temporary road.

COMMENTS FAVORING ALTERNATIVE 2

a. "Partial thinning is desirable to increase worthwhile future conditions...It is my recommendation for a favorable outcome of Alternative 2 Proposed Action."

Response: Positive comment. No response necessary.

b. "Please proceed with the fuel reduction program in the Mt. Ashland area."

Response: Positive comment. No response necessary.

CRITICISMS OF ALTERNATIVE 2

The Environmental Protection Agency is concerned with the construction and use of temporary spur roads under this alternative.

c. "While the EIS states that the construction and use of the temporary spur roads will have minor impacts on habitat, impacts under Alternative 2 are the greatest due to the number of road spurs that will be constructed under this action alternative. To minimize impacts from the construction and use of road spurs

we recommend that the Forest Service select the alternative that will have the least amount of road spurs (Alternative 5 with 9 road spurs) and avoid construction of road spurs that cross streams and riparian areas."

Response: The KNF agrees that impacts from spur roads are more likely to occur under Alternative 2. The Preferred Alternative addresses this issue. Temporary spur road construction has been reduced to 1.7 miles (8 spurs) and there will be no temporary spur construction in Riparian Reserves.

2.4 ALTERNATIVE 4 (CODE 203)

Alternative 4: This alternative differs from Alternative 2 by reducing acres treated, reducing the use of ground-based yarding systems, and the construction of temporary spur roads. This alternative would treat 4,185 acres in 217 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,079 acres and small diameter thinning for trees <9" on 408 acres. Defensible fuel profile zones would be created by using variable density thinning on trees >9" on 1,275 acres. Ground-based systems would be used on 965 acres. Helicopter yarding would be used on 861 acres. Underburning would occur on 1,438 acres and mastication would occur on 617 acres. Spur road construction would include 4.96 miles of new temporary road with six fewer roads and six fewer landings than Alternative 2.

There were no comments received that particularly addressed Alternative 4.

2.5 ALTERNATIVE 5 (CODE 204)

Alternative 5 (from DEIS—it has since been modified in the FEIS): This alternative differs from Alternative 2 by reducing acres treated, reducing the use of ground-based systems, reducing the use of mastication equipment, increasing the use of helicopter yarding, and minimizing the construction of temporary spur roads This alternative would treat 4,612 acres in 258 stands. As part of the restoration treatments, variable density thinning of trees >9" would occur on 2,579 acres and small diameter thinning for trees <9" on 408 acres. Defensible fuel profile zones would be created by using variable density thinning on trees >9" on 1,202 acres. Ground-based systems would be used on 1,065 acres. Helicopter yarding would be used on 1,245 acres. Underburning would occur on 1,536 acres and mastication would occur on 745 acres. Spur road construction would include 2.27 miles of new temporary road with 13 fewer roads and nine fewer landings than Alternative 2.

In their letter, the Environmental Protection Agency recommends that the USFS select Alternative 5 for implementation because that alternative has the least road spurs and minimum cumulative watershed effects in the project area.

a. "To minimize impacts from the construction and use of road spurs we recommend that the Forest Service select the alternative that will have the least amount of road spurs (Alternative 5 with 9 road spurs) and avoid construction of road spurs that cross streams and riparian areas."

Response: The Preferred Alternative addresses this issue. Temporary spur road construction has been reduced to 1.7 miles (8 spurs) and there will be no temporary spur construction in Riparian Reserves.

b. "The proposed action alternatives will have varying degrees of cumulative watershed effects due to the amount of treated acres, acres treated with ground-based equipment and the number of temporary spur roads constructed. Alternatives 4 and 5 were designed to respond to some of the significant cumulative watershed effects. All the proposed action alternatives are consistent with Aquatic Conservation Strategy (ACS) objectives such as maintaining water quality, retaining large trees and snags and the retention of coarse woody debris. The Klamath National Forest (KNF) Beaver Creek Ecosystem analysis also recommends reductions in road density and fuels within watersheds. Only Alternative 5 meets both the ACS and KNF Beaver Creek Ecosystem analysis objectives and recommendations, and consequently will have the fewest cumulative watershed effects. We recommend that the Forest Service select Alternative 5 for implementation to minimize the cumulative watershed effects in the project area."

Response: Please refer to response to comment 2.1b on p. 51.

2.6 COMMENTS ON ALTERNATIVES CONSIDERED BUT ELIMINATED (CODE 205)

A group of respondents are concerned that their previous input on alternatives has been refused by the USFS. They contend the USFS has formulated the purpose and need so as to exclude other alternatives previously submitted. They also believe the proposed road construction will obstruct attainment of the purpose and need.

a. "Our organizations support the purpose and need for this project. Indeed, in our scoping comments of 10/28/05 we submitted a Citizens' Alternative pursuant to HFRA, designed to accomplish the stated purpose and need for the project while avoiding new road construction in this AWWC and LSR. Unfortunately the Forest Service refused to develop, analyze or implement an action alternative that met the stated purpose and need for the project while avoiding new road construction in the impaired watersheds of the Mt. Ashland LSR."

Response: Please refer to the response to Comments 1.4 a and b on p. 14

A group of respondents claims the USFS refused to develop or consider a no-tractor yarding alternative or consider implementing Alternative 3 because of economic feasibility. They contend the USFS arbitrarily restricted a reasonable range of action alternatives regarding yarding and hauling mechanisms in a LSR with an impaired watershed in favor of economic preference for the timber industry.

b. "The agency refused to develop or consider a no tractor yarding alternative because 'Historically, timber sales on the Forest that are helicopter/cable only have not sold due to high costs and low or nonexistent profit margins.' (DEIS 2-29). Similarly, the Forest Service refused to consider implementing Alternative 3 (No Temporary Spur Road Construction) because it 'would require funding so much in excess of the other action alternatives that it may not have been possible to implement.' While our organizations are committed to working with the agency to develop a project that is economically feasible, it is imperative that the Forest Service realize that it may not arbitrarily restrict the reasonable range of action alternatives regarding yarding and hauling mechanisms in a LSR that is impaired watershed simply due to the economic preferences of the timber industry. Indeed, decisions based entirely on profit margins violate NFMA's requirement that a given logging system cannot be chosen because of dollar value alone. There is no other justification for using the ground-based logging systems and new road construction in the impaired LSR given in the record besides economic considerations, while many reasons are identified illustrating why using such systems is not appropriate for this LSR."

Response: Economics are one of several considerations that went into formulating a reasonable range of alternatives in the EIS. A complete discussion of variables analyzed is included in Section 3 of the EIS. The alternatives analyzed include the No Action Alternative which involves no road building or tractor yarding and the decision maker may choose to implement any part of the alternatives within the range of alternatives and scope of analysis. Part of the justification for dismissing Alternative 3 is that, based on preliminary watershed modeling, it was determined that watershed effects were between 0 and 2% different (0-.02 change) between Alternative 3 and the other action alternatives. A change of .02 in modeled results is an indistinguishable difference between alternatives and is undetectable on the ground (de la Fuente pers. comm.). The undetectable difference between effects of the alternatives, combined with a significantly higher estimated cost over the other action alternatives, resulted in the dismissal of Alternative 3.

2.7 ADDITIONAL ALTERNATIVES SUGGESTED (CODE 206)

a. "I believe a better plan would focus on thinning the dense second-growth forest stands and completely avoid new road construction and yarding through riparian reserves in the Mt Ashland Old-Growth Reserve."

Response: Indeed the proposed action is focused on primarily dense second-growth forest stands. The great majority of trees removed would be <20" DBH. Conditions describing when a tree larger than 20" DBH would be removed are discussed in Sections 2.3.1, 3.2.4 and 2.2.24 of the FEIS. No temporary spur construction is proposed in across streams or riparian areas. No spur construction in proposed in Riparian Reserves in the Preferred Alternative or Alternative 5. The analysis of no road construction is covered within the range of alternatives when considering the No Action Alternative. For a discussion of yarding in riparian areas see response to comment 1.9o on p. 45.

b. "The need to reduce road density and treat overgrown second-growth stands for wildfire hazard speaks directly to the need for additional action alternatives. The DEIS only proposes action alternatives that would increase cumulative watershed effects beyond acceptable limits via new logging road construction, landing construction, ground-based yarding, and group selection logging activities. Additional alternatives that are limited to watershed restoration and light understory thinning of overstocked stands would provide the means to achieve management objectives without compromising aquatic habitat in this AWWC."

Response: The two main objectives from the purpose and need are to (1) reduce the threat of catastrophic (stand-replacing) wildland fire, and (2) restore and maintain late-successional forest habitat for late-successional forest related species. The action alternatives in the FEIS would accomplish these objectives. Watershed restoration is not part of the purpose and need. Because of the significant issue of cumulative watershed effects, the project was designed to minimize effects and avoid significant adverse effects. Cumulative watershed effects are discussed in the FEIS Section 3.4.3. Aquatic habitat is maintained not expected to incur significant changes to stream temperatures or flow and sediment regimes as is described in Section 3.4 of the FEIS. All of the alternatives analyzed are in compliance with the Aquatic Conservation Strategy which provides aquatic habitat guidance within the LRMP.

2.8 MONITORING (CODE 208)

Several respondents see the need for more monitoring. Some contend the USFS has failed to conduct the baseline monitoring necessary to confirm cumulative effects for watershed and aquatic resources, sediment and turbidity, snags associated with Management Indicator Species, and MIS population surveys.

a. "many [watershed] cumulative effects methods fail to identify monitoring needs that will confirm whether cumulative effects goals are being attained."

Response: Monitoring associated with the project is identified in Section 2.3.3 of the FEIS.

b. "the Klamath National Forest violated its LRMP, and NFMA, by failing to monitor and survey for snag associated MIS species in this very same watershed via the illegal Beaver old-growth timber sale."

Response: Please refer to responses to comments 1.1f and 1.1g on pp. 9 and 10, respectively.

c. "Aquatic Conservation Strategy. The KNF has not conducted baseline water quality monitoring for sediment and turbidity necessary to determine if this project will violate the ACS or the Basin Plan (and hence the CWA)."

Response: ACS Objectives are discussed in the FEIS Section 3.4.3, how the ACS objectives are being met is in the Appendix to the Watershed Report (B. Thomas and Snavely 2007).

d. "In attempting to shirk its non-discretionary duty to survey, the USFS is fond of contending that Inland Empire only requires MIS population survey information when there is not enough underlying data to support habitat analysis. While this contention is incorrect and the duty to monitor (from both NFMA and the LRMP) is non-discretionary, even using the Forest Service's reading of Inland Empire we find that population surveys are required here."

Response: Please see response to comment 1.1g on p. 10.

e. "The following contention in the MIS Assessment (page 1) is flatly incorrect: 'The Monitoring Requirements in Chapter 5 of the Klamath National Forest Land and Resource Management Plan (LRMP) do not require population monitoring or surveys on MIS with the exception of steelhead trout and rainbow trout.' In fact (as recognized by the court in KS Wild v. USFS) the KLRMP (at 5-3) clearly states that '[P]opulation trends of the management indicator species will be monitored and relationships to habitat changes determined.' It simply doesn't get much clearer than that."

Response: Please see response to comment 1.1g on p. 10.

3. COMMENTS ON EFFECTS OF PROPOSAL

The majority of the comments received focused on the effects of treatments. Comments were received both in favor of, and against the treatments proposed in Alternative 2. Additional analyses and proper disclosure were suggested in many cases. Inconsistency with Forest Plan Standards was pointed out by some. While most seemed to agree that the project could have positive impacts, many suggestions were made to minimize environmental impacts and/or make the project more economically viable.

3.1 VEGETATIVE TREATMENTS (CODE 300)

The concern of environmental effects of vegetative treatments was widely expressed both positively and negatively. Comments were received which suggested that vegetation treatments be curtailed to minimize environmental impacts. Others suggested that it was important to maintain economic viability of the project by maintaining the treatment levels presented in the DEIS. Several indicated insufficient analyses of cumulative effects from past logging practices. Some stakeholders indicated that the impacts of thinning are not fully disclosed. There were several letters that expressed concern about logging and yarding in riparian areas.

a. "The Mt. Ashland DEIS fails to adequately address the cumulative impacts 'which result from the incremental impact of the action when added' to the already heavily impacted condition of the watershed, the effects of other past, present and future timber sale, the individual components of the proposed action and the cumulative effects of the individual components"

Response: The cumulative effects of past, present and reasonably foreseeable future actions, combined with the proposed Project, are addressed in the FEIS on Pages 3-34, 3-38, 3-46, 3-49, 3-51, 3-54, 3-56, 3-58, 3-60, 3-61, 3-63, 3-66, 3-69, 3-71, 3-74, 3-77, 3-79, 3-113, 3-130 through 3-131, 3-137, 3-140, 3-143, 3-151 and 3-175. Cumulative effects are also addressed for each resource in each resource specialist report, including the Cumulative Watershed Effects Specialist Report, which can be found on the Forest webpage: http://www.fs.fed.us/r5/klamath/projects/projects/fuels/oakknoll/mtashland/. All actions that were considered in the effects analysis are summarized in Appendix B—Cumulative Effects Summary—of the FEIS.

b. "It is imperative prescriptions be implemented as written. It will significantly detract from any sale offering if the desired number of leave trees, leave basal area (BA), and post project canopy closures are not achieved (leaving too many trees or the resultant stand too dense). More often than not once harvesting is complete it becomes apparent the level of thinning desired was not achieved."

Response: Prescriptions for the Mt. Ashland LSR Project are displayed in Section 2.3.1of the FEIS. The Forest intends to implement the prescriptions as written by having resource specialists (e.g. wildlife biologist, silviculturist, soil scientist) participate in the implementation of the prescription on the ground.

c. "Practices such as felling, ground-based yarding, roading and landing construction occur on relatively small units. These activities lead to changes in site processes such as increases in snow accumulation, now melt rate, surface erosion, and landsliding. During a single large flood event, these individual alterations collectively may lead to substantial increases in streamflow and erosion downstream. Other types of basin cumulative effects include changes in water temperature, and stream chemistry."

Response: Refer to Response 1.9l p. 44

d. [NOTE: Contradiction pointed out by the respondent] "In addition to the activities in riparian reserves discussed above, despite the fact that the Beaver Creek Watershed is at 'increased likelihood of cumulative watershed effects' (DEIS 3-131) the proposed action nevertheless calls for:

1. 40 new landings, permanently compacting soils and removing vegetation from 25 acres (DEIS 3-134);
2. 1,202 acres of 'ground based mechanical yarding [that] will compact soils from repeated passes of track or rubber-tired skidders on existing and new skid trails and temporary roads.' (DEIS 3-135);
3. The construction of 'temporary spur roads [that will] result in short-term loss of vegetative cover, soil displacement and compaction.' (DEIS 3-134);
4. The use of slashbuster masticators on steep slopes. (DEIS 2-18);
5. Crossing streams and riparian reserves with slashbuster masticators. (DEIS 2-23;
6. Placing fill in riparian features in order to facilitate the use of heavy equipment. (DEIS 2-23);

7. Please note that while both 3-139 and 2-23 of the DEIS assume that heavy equipment will be used in riparian reserves and in riparian features, and that yarding corridors may be located through these reserves, page 2-20 of the DEIS inexplicably contends that '[h]eavy equipment will not be used within 170' of streams and riparian treatments will not reduce canopy cover ...'"

Response: Activities proposed in the Mt. Ashland LSR Project are designed to have long term benefits to the LSR. Use of yarding equipment, masticators, spur roads and landings to facilitate restoration activities may have some short-term negative effect in order to meet project objectives and to have long-term beneficial effects. The negative impacts of the proposed actions are described in the FEIS in Chapter 3. Although landings will be construction, landing construction does not necessarily lead to permanent compaction, and some landings will be ripped, after use to minimize effects. Ground-based mechanical yarding will be used for thinning activities; although some compaction may occur, conservation measures have been included to minimize effects of yarding and avoid detrimental compaction. As a clarification to the FEIS, masticators will be used on slopes generally less than 35%.

As discussed in Response 1.9o, there will be no timber harvest within Riparian Reserves in the first 170'. Thinning may occur in the upland in the outer 170–340' of Riparian Reserves on less than 1% of the project area; there will be no equipment in riparian areas (wet areas), riparian vegetation, or inner gorges. In some treatment stands, ephemeral draws (or summer-dry swales that transport snow melt) may be encountered that were not previously known or mapped in GIS. These ephemeral swales carry only snowmelt, not surfaced groundwater and are not classified as

Riparian Reserves. If logs need to be skidded across these draws, skid areas will be designated by the sale administrator to avoid riparian vegetation and to minimize potential effects. Rarely would fill material or logs be used to facilitate yarding across an ephemeral draw because those situations are avoided unless skidding across a draw would result in less impact that going around the draw.

e. "The DEIS (2-23) acknowledges that: (1) skid trials and skyline corridors will cross riparian areas; and that (2) fill may be added to riparian features to facilitate such yarding activities. Yet the site-specific locations and impacts of yarding through, and placing fill in, riparian reserves is not disclosed or analyzed in the DEIS. Indeed, the public and the decision maker are precluded from knowing the location, frequency, or impact of these activities."

Response: Refer to Response 3.1d on p. 63. There will be no equipment or fill in riparian areas (wet areas), riparian vegetation, or inner gorge. If logs need to be skidded across ephemeral draws as discussed above, skid areas will be designated by the sale administrator to avoid riparian vegetation and to avoid adverse effects. Rarely would fill material or logs be used to facilitate yarding across an ephemeral draw because those situations are avoided unless skidding across a draw would result in less impact that going around the draw. The locations where these situations may occur are not known until stands are marked or during implementation, and therefore the specific locations cannot be disclosed in the EIS. In general, based on past experience (Blessing pers. comm.; Holmes pers. comm.), skidding across draws is a rare event and impacts are insignificant when considered at the project scale (Snavely 2007a). Rehabilitation of skid trails or corridors may occur as discussed in the Conservation Measures for Soil.

Cable yarding systems may be set up across a Riparian Reserves or creeks depending on the capability of the yarder being used. In these situations, the purchaser will identify needed cable corridors for approval by the sale administrator. In general, tying off across a stream is a method used to increase deflection for cable yarding; logs are not usually carried over the Riparian Reserve, only the carriage or the mainline cable cross the creek. Increased deflection results in higher suspension of logs and the ability to negotiate small ridges or flat areas.

f. "Regarding the Logging Plan and 'Riparian reserves'. The logging plan allows yarding logs in the sensitive riparian habitat. This habitat is fragile, so yarding logs is an abusive practice, and should NOT be permitted. The sensitivity of the riparian habitat is recognized by the plan, but violated by the plan to yard logs in a sensitive area. Bad planning I would have to say."

Response: Refer to Responses 3.1d and 3.1e on p. 63 and 64. There will be no commercial timber harvest or yarding of trees >9" DBH within the first 170' of Riparian Reserves. Skyline corridors crossing Riparian Reserves will require full suspension across permanent and intermittent streamcourses. Fuels treatments are proposed within the first 170' of Riparian Reserves to reduce ground and ladder fuels and minimize potential for a running fire in riparian

strips. Fuels treatments would include thinning of small diameter material (trees <9" DBH) and using a combination of lop-and-scatter, hand-piling or underburning to treat fuels.

g. "As stated in our scoping comments of 10/28/05, our organizations are generally supportive of the proposal to conduct thinning-from-below and underburning activities in dense second-growth white fir stands within the Project Area. It is our hope that such thinning will help to re-establish the historic species composition of these stands and allow for re-introduction of fire into this fire evolved and fire dependent ecosystem. The fact that the vast majority of these stands have been previously logged heavily influences our general support for the silvicultural prescription."

h. "Based on discussions with the LSR working group, the intent of treatments within LSR's was to achieve management with as few treatment entries as possible with one treatment being preferable...For the long term it appears more trees will be on the site than desired. This will eventually lead to increased competition, stress, and fuel hazard. I ask why not thin a little heavier this entry in order to insure meeting your long term desired condition without having to deal with these issues in the future. This could also add more value to assist with economic viability for the project."

Response: The desired condition is displayed in the FEIS Section 1.3.3. The proposed treatments are designed to move the area from current conditions to desired conditions to the extent possible and practical under current fiscal and environmental constraints. The thinning prescriptions were designed to promote growth of larger trees, but they were also designed to maintain existing NSO habitat where it occurs. In order to maintain NSO habitat and to create stands of variable density, more trees will be retained on north and east aspects and lower on slopes. These types of treatments meet the objectives of the Northwest Forest Plan to protect and enhance conditions of late-successional and old-growth forest ecosystems which serve as habitat for…NSOs (USDA Forest Service and USDI Bureau of Land Management 1994b, C-11). Modeling results indicate that the proposed prescriptions will result in stands within the desired range of basal area and with 15% more large trees on the landscape 50 years post-treatment (FEIS Section 3.1.4). This meets the Forest's long-term objectives for stands in the Project Area.

i. "For the Mt. Ashland LSR Project DEIS the agency failed to develop or analyze a reasonable action alternative to achieve the purpose and need for the project while avoiding the impacts associated with tree-removal for 'temporary' road construction on NSOs, critical habitat, hydrological, soil and other forest values."

Response: A wide range of alternatives was developed for the project. The Forest initially developed four action alternatives to address the purpose and need with proposed temporary spur road construction ranging from 0 to 6.86 miles. The Forest proceeded to conduct detailed analysis of three action alternatives that ranged from 2.27 to 6.86 miles of temporary spur construction. Alternative 3 (which had no temporary spur construction) was eliminated from detailed study for the reasons stated in FEIS on Page 2-27 and in Response 2.6b. The Preferred Alternative was also developed to address this issue by reducing the spur road construction to 1.70 miles. The Preferred Alternative minimizes effects of spur road construction by limiting the location of spurs

to ridges and upper slopes (refer to Map X). The effects of spur road construction on habitat, water, and soils have been minimized by Conservations Measures that have been included in all action alternatives (FEIS Section 2.3.2). The effects of temporary spur road construction have been analyzed in the FEIS throughout Chapter 3. The effects of cutting trees in areas where temporary roads are built is minimal to none.

j. "the DEIS nevertheless calls for a number of practices known to harm water quality and inhibit attainment of the objectives of the ACS and of the CWA requirements of the Basin Plan."

Response: ACS Objectives will be met for all of the action alternatives as described in the FEIS in Section 3.4.3.2, and in the Appendix to the Watershed Report (Snavely 2007a). Requirements of the CWA are described in Response 1.1h on p. 11. Overall, effects of the project on water quality are expected to be immeasurable and are expected to result in beneficial effects in the long term (FEIS Section 3.4.3.2)

k. "This project should avoid actions like new road construction and ground based yarding which will contribute to sediment production and further limit salmonid reproduction."

Response: In order to manage forest vegetation and reduce the potential drastic negative effects of wildfire on the watershed, increased sediment production is a by-product. One of the goals of this project is to keep the increased sediment to a level that will not significantly limit salmonid reproduction. Conservation Measures have been included in all action alternatives to minimize the effects of temporary spur construction, spur decommissioning, and ground-based yarding. The small modeled increases in surface sediment risk (USLE Model), a change ranging from .0 to .1 in the modeled values, suggests an incremental increase in erosion but no sediment is expected to reach streams or effect salmonid habitat (FEIS Section 3.4.3.2).

l. "Scientific understanding of the ecological effects of mechanical thinning is incomplete, but evidence suggests that such treatments, even when carefully implemented, can adversely affect the environment in key ways. Mechanical thinning can:

1. Remove large trees that are disease and fire resistant (DellaSala et al. 1995,; USGAO 1999; Gorte 2000a, 2000b).
2. Increase mortality of residual trees due to pathogens and mechanical damage to boles and roots (Filip 1994; Hagle and Schmitz 1993).
3. Damage soil integrity through increased erosion, compaction and loss of litter (Harvey et al. 1994; Meurisse and Geist 1994).
4. Create sediment pulses in streams that harm fish (Grant and Wolff 1991; Beschta 1978).
5. Retain insufficient densities of large trees and woody debris to sustain viable populations of cavity nesting and woody debris dependent species (DellaSala et al. 1995).
6. Reduce habitat quality for sensitive species associated with cool, moist micro sites or closed canopy forests (FEMAT 1993).
7. Mechanical thinning proposals advanced by federal foresters in the Siskiyous routinely require incidental take permits to harass, harm or kill species listed as threatened under the Endangered Species Act. Several known pairs of northern spotted owl reside in the analysis area. To the degree

that thinning opens forest canopies and eliminates multi-layered internal forest structure, it generally is not compatible with conservation of critical habitat for spotted owl or other sensitive species known to exist in the analysis area including Pacific fisher, pileated woodpecker and northern goshawk."

Response: The proposed project is designed to restore and promote late-successional forest habitat and to reduce fuels. Trees larger than 20" in diameter would not be selected for removal. Thinning will be from "below" which implies that the smaller trees in these stands are the ones to be removed. Large snags and CWD will be retained to the extent possible and Conservation Measures have been incorporated to retain large tree character (FEIS Section 2.3.2).

Careful attention to skidding corridor location and falling trees in the proper direction to those corridors will greatly minimize damage to the residual stand. These are standard practices during the tree removal phase of the project with oversight of the operation. Studies have shown thinning can significantly reduce mortality compared to unthinned areas and that insect pests do not kill just unthrifty, slow growing trees (Fiddler et al. 1995).

Impacts to soils are analyzed in the FEIS Section 3.5.3. Increased erosion, compaction and litter loss in skid trails are the result of mechanical thinning with ground-based equipment. Regional and Forest guidelines allow for a certain amount of ground disturbance, compaction and litter loss in order to manage forest vegetation. These guidelines set a limit of at least 85% of the area dedicated to growing vegetation must maintain its inherent productive capacity to produce forest vegetation. Powers et al. (2005) reported findings after 10 years from the North American Long-term Soil Productivity Study plots. They reported that changes in C and N had no general effects on standing forest biomass after 10 years. They also showed that tree growth tended to be increased on sandy soils and decreased on clayey soils. There are no clayey soils in the project area. Most of the soils are sandy loams.

Impacts on water quality and fisheries are discussed at length in the FEIS Section 3.4.3. The analysis concludes "The small amount of sediment generated by the action alternatives will not be measurable at any one site, and will be intercepted by riparian reserves before it could enter stream channels. Effects are negligible." Impacts on habitat for NSOs and sensitive species are also minor as discussed in the FEIS Sections 3.2.4 through 3.2.20. Nesting habitat for NSOs will be maintained and habitat for late-successional forest related species will be improved in the long-term.

m. "Logging spreads dwarf mistletoe. Logging practices contribute to the spread of dwarf mistletoe. When soils are disturbed and ground cover is removed during logging operations, stand densities increase because pine seedlings readily germinate and grow on bare mineral soil. Such disturbances are particularly prevalent when heavy machinery is used to remove trees.

1. Thinning large trees that host mistletoe is not the best way to improve stand health because under normal ecological conditions, there would be minimal tree regeneration (and thus minimal new infections) near infected trees because of fires and competition from grasses. Removing large trees creates a forest that is quite unlike anything that historically existed.

2. Logging may increase mistletoe in the remnant stand, not decrease it. Many mistletoe seeds that infect host trees do not readily produce aerial shoots; these are known as 'latent infections' (Knutson and Tinnin 1980). After thinning, 90 percent of all latent infections will appear within five years (Shea 1964).

3. To really reduce mistletoe, further logging would be necessary after this entry; the DEIS fails to disclose that fact. Also, mistletoe seed production will increase with improved nutrition of the infected leave trees. More open stands will promote regeneration, and the new trees can become infected by the mistletoe seeds. Moreover, increased mortality can occur in the remaining overstory trees; some heavily infected trees are not able to adjust to release from competition (Knutson and Tinnin 1980). The DEIS fails to disclose this.

4. We are particularly perplexed about the agency's proposed treatment of mistletoe in this LSR given that the DEIS (3-14) found that 'stand level infections are currently low.'"

Response: The prescription for the project is a variable density thinning from below. Trees over 20" in DBH will be retained as part of that prescription, including large trees infected with mistletoe. Refer to Response 1.8p on p. 31 for a complete discussion on mistletoe.

3.2 HARVEST SYSTEMS (CODE 301)

The majority of comments on harvest systems were on the impacts of equipment to soils and riparian reserves.

a. "We have a number of concerns about the potential impacts that widespread use of the Slashbuster on forest understory vegetation. Native plants could be harmed or extirpated, and it is unclear if buffering plant sites has been effective in previous Slashbuster treatments. How the understory responds has never been studied, and with the amount of masticated material left on the site years after a treatment it is likely that some native understory will be lost."

Response: Surveys for Threatened, Endangered, Sensitive and Survey and Manage species have been conducted within all areas proposed for ground disturbance (USDA Forest Service 2006e). To date, no plants on the sensitive, threatened, endangered or survey and manage species lists have been located in mastication treatment areas and buffers for listed species are not necessary. There will be no effects to these species from masticator treatments in other units where the species are not present.

The Forest has monitored mastication since 2001 (Monitoring Reports available at the Supervisor's Office). Monitoring has shown that 31-75% of the soil surface within masticated

areas remains undisturbed. Soil disturbance from equipment tracks is generally considered light due to equipment operating over the masticated material (wood chips). Monitoring has shown that heavy disturbance, in the form of compaction and soil displacement, can vary from 0-12% and averages 3% of the masticated area. This type of disturbance is usually in access trails used by equipment to enter and leave the unit. Occasionally, soil displacement occurs where the equipment makes turns and scalps or pushes soil into a small mound. The disturbed area is generally less than a square meter in size. This is considered moderate displacement and is usually does not affect soil productivity because its size is too small to affect biomass growth.

Mastication increases the amount of fine organic materials in contact with the soil. This material can decrease transpiration and surface soil temperatures as well as increase soil moisture. There will be an increase in nutrient cycling from leaching and increased biological activities due to an increase in available fine organic materials. Mastication of nitrogen fixing plants may also release some of the fixed nitrogen in the below ground root nodules.

There will be a change in the soil biota to organisms that can digest larger materials. Mychorizal communities will remain. As the plants are cut, their nutrient and water demands decrease, thusly decreasing the root system. There may be a short-term decrease in mychorizal activity, but this will quickly increase as root systems respond to vigorous plant re-growth.

Standard and Guidelines were integrated into project design to protect biodiversity and plant species. Surveys were conducted to locate and protect rare plants. The dense stands proposed for treatment have low percent cover and diversity of herbaceous and fungi species. Opening up the stands by thinning and fuel treatment by mastication is likely to result in an increase in herbaceous and fungi species diversity. A discussion of the effects on understory plant species can be found in Chapter 3 of the FEIS. Effects on special status plant species are described thoroughly in the Botany BA/BE (USDA Forest Service 2007g), available in the project files.

b. "I have concerns about the economical viability of this project. You are proposing to harvest small diameter material, low volume per acre, and lesser valued species by utilizing very expensive harvest systems. All three treatment alternatives contain a significant amount of helicopter logging. The economic viability of this project needs to be considered carefully if the Forest is serious about implementing the project and achieving the long term desired conditions for the LSR."

Response: See Response to 2.1d on p. 53.

c. "Utilize ground based and cable harvesting wherever feasible. I support the use of constructing temporary roads to assist with utilizing less expensive harvest systems. There has been considerable opposition to constructing temporary roads but they are needed in order to make the project even approach viability. The

analysis of the temporary roads in the EIS exhibit very small increases in road density during the project while post project densities are actually less than pre-existing densities (Table 3-4)."

Response: The Preferred Alternative addresses this issue. Ground-based and cable yarding systems have been proposed as tools for restoration thinning wherever feasible. Field verification and layout during the 2007 field season resulted in additional cable yarding and a minor reduction in ground based yarding in the Preferred Alternative (refer to Table 2-6 in the FEIS). Helicopter yarding has been reduced in this Alternative but is still a feasible tool where access is limited. Although the modeled effects of temporary spur road construction under the action alternatives was minor, the Forest decided to develop a Preferred Alternative with minimal spur road construction in order to address controversy surrounding the effects of spur road construction. The cost of the proposed treatments, including fuels treatments, may exceed revenues generated by commercial timber harvest, however, the Forest has the option to use stewardship and grant authorities to supplement revenue generated by the project.

d. "The biggest concern from AFRCs perspective is the economic viability of this project. Minimize the use of helicopter harvesting. With current log values, stump to truck costs do not pay for the value of the timber being removed. This does not even account for the haul cost."

Response: See responses to 2.1d on p. 53 and 3.2c on p. 69.

e. "Utilize helicopter harvesting only were absolutely necessary. With current log values, stump to truck costs do not pay for the value of the timber being removed. This does not even account for the haul cost."

Response: Helicopter yarding will be used only where ground-based yarding is not feasible or where it is inappropriate from a resource protection standpoint. See responses to 2.1d on p. 53 and 3.2c on p. 69.

f. "Wherever helicopter harvesting is proposed it is essential that helicopter landings be within ¼ mile from harvest units in order to reduce significant flight costs. The number of proposed helicopter landings did not increase from Alternative #2 to #5 even though Alternative #5 has a significant increase in helicopter acres. This would lead me to think much of the increased acreage would have flight distances greater that ¼ mile. I'm not sure if the Forest evaluated the need for helicopter service landings. This would lead to an increase in land impacts than what is assessed in the current document."

Response: See response to comment 2.1d on p. 53.

Many also expressed concern about operations with riparian reserves and within Areas With Watershed Concerns:

g. "IMPAIRED WATERSHEDS WITHIN A LATE SUCCESSIONAL RESERVE MUST NOT BE FURTHER DEGRADED...the DEIS considers three action alternatives that all call for significant new 'temporary' road construction, ground-based yarding activities, the construction of numerous landings, group selection logging, and yarding activities (including road construction) in riparian reserves. We

believe that these practices are inappropriate for a Health Forest Restoration Act (HFRA, HR 1904) project located within a Late Successional Reserve (LSR) that serves as Spotted Owl Critical Habitat (CHU CA-14 and CHU OR-76) within Areas With Watershed Concerns (AWWCs) as designated by the Klamath LRMP.

Response: Refer to response to Comment 1.6m on p. 21.

h. We urge the Forest Service to work collaboratively with the commenting public to implement the proposed variable-density thinning, small-diameter thinning, and fuel treatments, while avoiding the harmful significant cumulative impacts to soils, hydrology and forest fragmentation associated with new road and landing construction, group selection harvest and ground based yarding in a AWWC."

Response: See responses to Comments 1.1 i and j and 1.2a on p. 12 and 13.

i. [See Letter #99, George Sexton, et al. for further discussion] "There are a number of site-specific actions proposed in the DEIS that may result in significant adverse cumulative impacts within this AWWC. The DEIS (2-28) calls for use of mechanical mastication on slopes up to 45% and calls for allowing mechanical slashbusting within designated riparian reserves (DEIS 2-23). The DEIS fails to point to any literature or studies indicating that mechanical mastication is appropriate on slopes in the 35-45% range in this highly impacted, and highly erosive, watershed."

Response: The slope limit for mechanical mastication operation has been changed to a maximum of 35% in order to minimize soil disturbance. No mechanized equipment will be allowed within the first 170' of Riparian Reserves. Cumulative effects have been addressed in Chapter 3 of the FIES (see response to Comment 3.1a on p. 62). No significant cumulative effects were identified in the analysis.

j. [EPA] "We support the use of existing roads, skid trails and landings, and the use of Wet Weather Operation Standards for the operation of equipment during ground-based operations. However, we are concerned that there will be circumstances that require crossing a riparian area with a skid trail. While techniques such as water-barring and the use of mulch on the last 25' of the skid trails will minimize soil erosion, some sediment releases will occur in riparian areas. In addition, it will be necessary to add fill and install culverts to some of these riparian area skid trail crossings. While the EIS states that the riparian reserve will be restored including restoring pre-project channel configurations, disturbances in these areas will result in impacts to the riparian areas.

Response: See preceding response to 3.1e on p. 64

k. The EIS states that soil that leaves skid trails is unlikely to reach streams due to the filtering capacity of the riparian reserves. However, it does not discuss or evaluate the direct impacts these skid trails will have on streams associated with the addition and removal of fill and culverts. The EIS needs to discuss in detail the direct impacts associated with the construction and restoration of skid trails in riparian areas. In particular the EIS needs to evaluate the impacts from the addition and removal of fill and culverts used for skid trails in riparian areas…"

Response: See preceding response to 3.1e on p. 64

l. "We have assigned a rating of EC-2 (Environmental Concerns - Insufficient Information) to all the alternatives presented in the EIS. This rating and a summary of our comments will be published in the

Federal Register. We have concerns with the impacts from ground-based silviculture treatments, the impacts from the temporary road spurs that will be constructed and the cumulative watershed effects. Additional information is needed on the impacts associated with the skid trails that will be constructed in riparian reserves and potential source water protection areas within and downstream of the project area."

Response: See responses to Comments 1.9a and 1.9e on p. 37 and 38

m. "This can be contrasted with the finding in the DEIS that unlike masticated stands, hand piled and underburned units remain more fire resilient over time. We strongly urge the agency to provide local employment via hand pile and burning treatments instead of mechanical mastication, particularly on steep slopes and within riparian reserves in this impaired watershed."

Response: Underburning and hand-piling are the only treatments proposed on slopes >35% or in the first 170' of Riparian Reserves. All of the action alternatives provide opportunities for local employment through contracts for timber harvest, hand-piling, underburning or use of masticators. The Preferred Alternative includes 981 acres of hand-piling and 3,747 acres of underburning which would provide jobs for several years. Between DEIS and FEIS, the use of masticators has been limited to slopes ≤35% and use of masticators has been reduced in the Preferred Alternative when compared to Alternatives 2 and 5.

n. "Consider allowing more temporary roads to be constructed to allow for more tractor and yarder logging. Temporary roads can be closed off and abandoned upon the completion of the harvesting if that is what is desired. When trying to minimize ground disturbance, it is often better to build, use, and abandon a temporary road, rather than construct a large 1 acre helicopter landing that will not be abandoned."

Response: Construction of temporary spur roads has been considered at varying levels in the action alternatives (6.86 miles in Alternative 2 to 1.7 miles in the Preferred Alternative). The effects of spur road construction is controversial and, although the modeled effects of temporary spur road construction under the action alternatives was minor, the Forest decided not to pursue an alternative with more spur road construction. Ground-based and cable yarding systems have been proposed as tools for restoration thinning wherever feasible. Field verification and layout during the 2007 field season resulted in additional cable yarding and a minor reduction in ground based yarding in the Preferred Alternative (refer to Table 2-6 in the FEIS). Helicopter yarding has been reduced in this Alternative but is still a feasible tool where access is limited.

o. "Ground based logging equipment should be permitted to work on slopes up to 45% as you allow in the DEIS for the masticators and grapplers to work on. These machines are on the same frames and do the same amount of traveling over the ground. There should be no distinction made as to their use. On the Colestine Stewardship project, we used a masticator that was mounted on a Timbco frame, the same frame we used with the Harvester. However, the Harvester had more restrictions. There should be no differences in their restrictions."

Response: Between DEIS and FEIS, the Forest made the decision to restrict all ground-based machinery (e.g. tractors and masticators) to slopes less that 35%. In ground-based treatment stands with pitches that exceed 35%, endlining will be used to yard trees, or steep areas will be

avoided. The restriction on ground-based machinery was based on input from the public during the DEIS comment period and during public field trips in 2007. There is little information available on the effects of machinery on slopes greater than 35%. Based on field monitoring of the Colestine Stewardship Project, masticators used on sandy slopes greater than 35% resulted in a higher percentage of heavy disturbance. Heavy disturbance was due to traveling and operating on slopes and sidehills greater than 35% resulting in scalped topsoil, sunken tracks and perpendicular troughs which have an accelerated erosion potential (Laurent 2007b).

p. "The DEIS (2-23) acknowledges that: (1) skid trials and skyline corridors will cross riparian areas; and that (2) fill may be added to riparian features to facilitate such yarding activities. Yet the site-specific locations and impacts of yarding through, and placing fill in, riparian reserves is not disclosed or analyzed in the DEIS. Indeed, the public and the decision maker are precluded from knowing the location, frequency, or impact of these activities."

Response: See preceding response to 3.1e on p. 64.

Several mentioned concern for the use of the slashbuster/masticator and its potential wide range of impacts.

q. "The use of the Slashbuster in certain areas could be altering hydrologic processes. Soil compaction, for example, is known to retard soil porosity and possibly increase runoff and peak flows.

Response: The use of a masticator may reduce soil porosity to the point of detrimental compaction if not operated under proper conditions. Conservation Measures, Soil Quality Standards, BMPs, and Wet Weather Operations guidelines are a part of the project design in order to minimize those effects.

Soil monitoring since 2001 has shown that 31-75% of the soil surface within masticated areas remain undisturbed. Soil compaction from equipment tracks is generally considered slightly increased due to equipment making one pass over an area and because the equipment operates over the masticated material. More heavily compacted areas can occur in access trails used repeatedly by equipment entering and leaving the masticated areas. Areas that may experience heavy compaction are limited in extent, usually less than 5% of the masticated area. Soil compaction monitoring in sandy loam soils has shown that 1-3 passes of a feller buncher tracked machine increased soil bulk density but did not exceed the 10% detrimental compaction threshold (Laurent 2006a). In addition, the area with decreased macro-porosity, which are areas disturbed by machine tracks is not of sufficient area to measurably affect infiltration and runoff on a unit basis. Increases in runoff, which could occur, would probably not be measurable.

Monitoring since 2001 has shown that high levels of soil cover remain after mastication. The unit average post-mastication soil cover ranges from 87-99% and averages 95%. Masticated cover is highly effective in preventing erosion compared to less dense soil cover under brush vegetation.

r. The widespread use of the Slashbuster may in fact alter soil nutrient cycling. How important nutrient cycles such are influenced by the use of the Slashbuster at the site level could be critical to the long-term site conditions. Soil biota is another important element of site level conditions that could be impaired by the Slashbuster. Lastly, the Slashbuster could harm mychorizal communities that are known to be important symbiots of many species."

Response: Mastication increases the amount of fine organic materials in contact with the soil. This material can decrease transpiration and surface soil temperatures as well as increase soil moisture. There will be an increase in nutrient cycling from leaching and increased biological activities due to an increase in available fine organic materials. Mastication of nitrogen fixing plants may also release some of the fixed nitrogen in the below ground root nodules.

There will be a change in the soil biota to organisms that can digest larger materials. Changes in the forest floor materials, whether natural or man-caused results in changes in the soil biota. These changes are mostly in response to types of materials needing decomposition and temperature changes. Mychorizal communities will remain. As the plants are cut, their nutrient and water demands decrease, thusly decreasing the root system. There may be a short-term decrease in mychorizal activity, but this will quickly increase as root systems respond to vigorous plant regrowth.

s. "Prioritization of Sites. We are curious how the Forest Service chooses the sites on which to implement the Slashbuster treatment. Is there currently a prioritization of vegetation density, proximity to the community protection zone, vegetation type, or any other parameters or vectors? It appears that the sites are chosen based on non-commercial lands where the slope is gentle enough for the Slashbuster to operate. Some level of prioritization for fuels treatments based on Urban Interface and ecological need is appropriate. What criteria are currently being used to determine the location of proposed slashbuster treatments?"

Response: See response to Comment 1.8u on p. 34.

t. "Siskiyou Mt. Salamanders. The DEIS fails to disclose the anticipated impacts of mechanical slashbusting on Siskiyou Mountain Salamanders and their habitat."

Response: Project effects on Siskiyou Mountains salamander (SMS) were analyzed in the FEIS Section 3.2.19. The project is outside the currently known range of the SMS but is within the Survey and Manage survey zone. The likelihood of presence is low. The Project Area was field assessed for potential habitat (rock talus) and potential habitat was located in isolated pockets of shaded talus. Surveys were conducted in potential habitat and no SMSs were detected. Conservation Measures include a restriction on ground-based equipment in talus habitat (FEIS

Section 2.3.1). Based on negative surveys and implementation of conservation measures, masticators will have no effect on SMSs.

u. "SLASHBUSTER MASTICATOR USE IS NOT APPROPRIATE IN THE LSR WITH IMPAIRED WATERSHEDS…Several concerns have been raised by prominent scientists that study chaparral, soils, Neotropical birds, fire behavior, and other implications of the widespread use of the Slashbuster."

Response: Effects of mastication, of which 'slashbuster' is a particular type of equipment application, are not well studied. However, some recent studies from the PSW Research Lab in Redding provide some insight to the issue of resident time and corresponding impacts. In one study, soil moisture as low as 20% by volume was sufficient to quench soil heating and inhibit the progression of lethal soil temperatures below the surface inch (Busse et al. 2006). Since masticated fuel beds help to maintain elevated levels of soil moisture (mulching effect) a reasonable hypotheses is that soil moisture levels are high enough in natural stands with coupled residual canopy shading to prevent unacceptable lethal effects to soil biota. It is generally assumed that the masticated fuel beds will suppress existing and germinating herbaceous vegetation, but have little to no effect on existing trees and shrubs. Mastication will have a negative impact on germination of most tree and shrub species which typically germinate better in mineral soils. The depth of the masticated fuel beds are variably continuous in distribution depending on the existing vegetation to be masticated. Such a patchy mosaic helps to assure survival of herbaceous and germinating species in the short-term (<= 5 years) when masticated fuel beds have their greatest effects on these classes. Masticated fuel beds will also contribute to increased soil moisture during the growing season (mulch effect), thereby increasing growth potential in the short-term. Decomposition of masticated fuels will likely increase CO2 production in the short-term due to the respiration of microorganisms as they break down the masticated material (Teakettle Experimental Forest preliminary findings, University of California - Davis, Davis, CA). In the short-term available soil nitrogen can be expected to decrease as microorganisms use this resource to break down the residue. Flame lengths have been observed to be less in masticated fuel beds than in natural fuel beds. This is due to the compressed and moist nature of masticated fuel beds which limit oxygen availability for the fire. Thus, masticated fuel beds may serve to lower flame lengths and slow the rate of fire spread.

Soil monitoring since 2001 has shown that 31-75% of the soil surface within masticated areas remain undisturbed. Soil compaction from equipment tracks is generally considered slightly increased due to equipment making one pass over an area and because the equipment operates over the masticated material. More heavily compacted areas can occur in access trails used repeatedly by equipment entering and leaving the masticated areas. Areas that may experience heavy compaction are limited in extent, usually less than 5% of the masticated area. Soil compaction monitoring in sandy loam soils has shown that 1-3 passes of a feller buncher tracked machine increased soil bulk density but did not exceed the 10% detrimental compaction threshold

(Laurent 2006a). In addition, the area with decreased macro-porosity, which are areas disturbed by machine tracks is not of sufficient area to measurably affect infiltration and runoff on a unit basis. Increases in runoff, which could occur, would probably not be measurable.

Monitoring since 2001 has shown that high levels of soil cover remain after mastication. The unit average post-mastication soil cover ranges from 87-99% and averages 95%. Masticated cover is highly effective in preventing erosion compared to less dense soil cover under brush vegetation.

The use of mastication machinery is an appropriate tool to use within the project area based on the above information and what is contained in the Soil Report.

See response to 3.2x on p. 77 for a discussion of neotropical birds.

v. "We are particularly concerned that the DEIS (2-23) indicates that masticators 'will cross RRs only at pre-designated crossing.' Why is the agency prescribing mastication that requires the crossing of riparian reserves? Why are the impacts, location and frequency of these proposed crossing not disclosed in the DEIS?"

Response (FEIS Correction): There is a distinction between the land allocation "Riparian Reserve", which is a buffer and includes upland (dry forest land) and the descriptor used to describe lush vegetation along banks of streams: "riparian area". There will be no timber harvest or use of masticators within Riparian Reserves in the first 170', this area includes the riparian vegetation. This is an equipment exclusion zone. Thinning may occur in the upland in the outer 170-340' of Riparian Reserves on less than 1% of the project area; there will be no equipment in riparian areas (wet areas), riparian vegetation, or inner gorge. In some treatment stands, ephemeral draws (or summer-dry swales that transport snow melt) may be encountered that were not previously known or mapped in GIS. If masticators need to cross these draws (most often dry with no riparian vegetation), crossings will be designated by the sale administrator to avoid riparian vegetation and to avoid adverse effects. Rarely would masticators cross draws; in general crossing of draws is done when the crossing would result in less impact that going around the draw (Holmes pers. comm.). The locations where these situations may occur are not known until stands are marked or during implementation, and therefore the specific locations cannot be disclosed in the EIS. In general, based on past experience (Blessing pers. comm.; Holmes pers. comm.), crossing draws with equipment is a rare event and impacts are insignificant when considered at the project scale (Snavely 2007a). Rehabilitation of crossings may occur as discussed in the Conservation Measures for Soil.

w. "Fire Behavior. Our organizations are very interested in learning about the impacts of slashbuster treatment on such 'fire variables' as residence time, short-term fuel loading, long term vegetative response, and microclimatic conditions on the site. Such information is simply absent from the DEIS."

Response: See response to 3.2u on p. 75.

x. "Neotropical Birds. Refugia for many species could be impaired by the widespread and ubiquitous use of the Slashbuster. The DEIS fails to adequately disclose or identify literature or scientific studies regarding impacts on Neotropical birds such that informed decision making can occur."

Response: The mastication of fuels has the potential to impact habitat for neotropical migratory birds associated with shrub and small diameter coniferous habitats, including species that nest on the ground within these habitat types. Direct effects to neotropical migratory birds would likely be most significant during the breeding season when mastication activities could destroy nests, cause adults to abandon nests, or displace young. Neotropical migrants in the Project Area typically do not start nesting until late April. Although there is variation between species, the breeding season is usually complete by the end of July. While the exact number of acres to be treated during the neotropical migratory bird breeding season in any given year is unknown, it is likely that a significant portion of acres treated by mastication will occur before April or after July, reducing potential impacts to breeding birds. Additionally, mastication is proposed on approximately 900–1200 acres or less than 9% of the Project Area. Thus, habitat for neotropical migratory bird species associated with shrub and early successional conifer habitat should remain well distributed across the Project Area.

3.3 BIOPHYSICAL CONCERNS–OLD GROWTH (CODE 302)

Many called for retention of all old trees and old growth structure. Others expressed concern with biophysical impacts from roads, landings and yarding in riparian reserves and elsewhere.

a. "The HFRA prohibits removal of old growth forest structure...The Congress specifically intended for covered projects to retain existing older forest structure that existed prior to fire suppression...Age or diameter limits to protect older forest structure, consistent with the HFRA, should be a required mitigation measure for the proposed action."

Response: See response to Comment 1.7b on p. 23.

b. "The Mount Ashland LSR does not contain adequate older forest habitat now...treatments should protect the largest and oldest trees with the best likelihood of contributing to desired late-successional forest structure, which the LSR Assessment places in the range of 11 to 17 inches in diameter at a minimum."

Response: The proposed project is designed to promote the development of late-successional forest and to retain older forest that currently exists in the Project Area. Groups of trees exhibiting old growth characteristics will be retained with a variable density thinning prescription, they will be some of the "skips", small areas totaling ~15% of the stand that are not treated. The proposed project is designed to protect the largest, oldest, most structurally diverse trees by retaining trees over 20" to the extent possible in habitat promotion stands. Not thinning trees in the 11-17" range

would prevent the project from meeting its purpose and need as trees in this range are partly responsible for the overstocked condition of many stands. Thinning prescriptions will be designed to leave the healthiest most vigorous trees within the 11-17" diameter range, thus favoring the trees most likely to develop late successional characteristics.

c. "Another 7 miles of roads will severely fragment wildlife habitat, and ecologically 'take off the table,' for many plant species, a large area of land that is either obliterated by the road itself or degraded by the edge effects of the road, including alteration of drainage. The Klamath-Siskiyou region is in desperate need of relief from the impacts of roads, and the Klamath should focus on repairing and removing its existing road inventory, not tearing additional ones through the forest under its stewardship."

Response: The construction of approximately 7 miles of temporary roads will have an effect on the seral stages of the plant species present within the road alignments. Mid-late seral plant species will be removed from the road construction alignments and to a much lesser extent from the edge habitat alongside the roads. These plant species are abundant throughout the project area, and none of these species are late-seral old-growth dependent species. The removal of species and habitat along approximately 7 miles of temporary roads is insignificant relative to the large amount of these common species and habitat that will remain within the project area.

Within the proposed temporary road alignments, and to a much lesser extent in the edge habitat alongside the roads, there will be a temporary increase in early seral plant species. These temporary roads will be closed and decommissioned after use, and succession will immediately start to change species composition from early seral to later seral stages. This temporary increase in early-seral species is insignificant relative to the large amount mid-late seral species present throughout the project area.

The construction of temporary spur roads has the potential to fragment wildlife habitat; however, effects would be expected to vary by species. For example, roads likely create barriers to movements for species with limited dispersal capabilities such as salamanders and mollusks. To date, surveys for Survey and Manage salamanders and mollusks have not detected any of these species within or adjacent to proposed temporary roads. Conversely, there is little evidence to suggest that highly mobile species such as the NSO and Pacific fisher would be significantly impacted by the level of habitat fragmentation typically associated with logging roads. Additionally, all temporary roads have been routed to avoid late-successional habitat and large diameter trees to the extent possible. Temporary roads, along with .49 miles of existing road will be decommissioned following project implementation, resulting in a net reduction in open road miles. Temporary roads are also designed to access mid-successional stands for restoration silviculture treatments and to create defensible fuel profile zones in an area that provides important inter-provincial connectivity for late-successional associated species. Therefore, by promoting the development of late-successional forests and by creating a landscape that is more

resilient to catastrophic wildfire, the long term benefits to the Klamath-Siskiyou region are expected to outweigh the short term impacts of temporary road construction.

d. "This project has the possibility of restoring old-growth conditions to an area that was first logged at the turn of the century if done with proper care and consideration."

e. "IMPAIRED WATERSHEDS WITHIN A LATE SUCCESSIONAL RESERVE MUST NOT BE FURTHER DEGRADED...the DEIS considers three action alternatives that all call for significant new 'temporary' road construction, ground-based yarding activities, the construction of numerous landings, group selection logging, and yarding activities (including road construction) in riparian reserves. We believe that these practices are inappropriate for a Health Forest Restoration Act (HFRA, HR 1904) project located within a Late Successional Reserve (LSR) that serves as Spotted Owl Critical Habitat (CHU CA-14 and CHU OR-76) within Areas With Watershed Concerns (AWWCs) as designated by the Klamath LRMP."

Response: See response to Comment 1.6m on p. 21.

f. We urge the Forest Service to work collaboratively with the commenting public to implement the proposed variable-density thinning, small-diameter thinning, and fuel treatments, while avoiding the harmful significant cumulative impacts to soils, hydrology and forest fragmentation associated with new road and landing construction, group selection harvest and ground based yarding in a AWWC."

Response: See responses to Comments 1.1i (p. 12), 1.1j (p. 12), 1.2a (p. 13), and 3.2h (p. 71).

3.4 HABITAT RESTORATION TREATMENTS (CODE 303)

Comments on habitat restoration were often nested in comments on equipment or vegetation effects and they are contained within those sections for the purposes of this report.

3.5 SNAGS AND LATE SUCCESSIONAL HABITAT (CODE 304)

In regards to snags and late successional habitat, some of the commenters were concerned that the DEIS overstated the lack of habitat in the DEIS and that the Forest has not provided adequate surveys of sensitive species within the project area. Another asserts that large downed logs retard fire intensity.

a. "The DEIS states many times that the project area is approximately 30% under the desired level, which is 60-65%, for late-successional characteristics. This statement does not reflect statements found in the FLSRA. Page 2-98 of the FLRSA states that the eastern LSR's, including Mt. Ashland, "should be able to maintain 45-65% of the capable ground as late-successional at any one time." A true reflection of the current condition should state the Mt. Ashland LSR is currently 17% below the minimum desired range for Late-Successional habitat and 37% below the maximum desired range. Treatments still need to occur in order to meet the long term desired range for this LSR but the situation is not as negative as stated in the DEIS."

Response: Please refer to response to comment 1.6k on p. 21.

b. "Based on discussions with the LSR working group, the intent of treatments within LSR's was to achieve management with as few treatment entries as possible with one treatment being preferable...For the long term it appears more trees will be on the site than desired. This will eventually lead to increased competition, stress, and fuel hazard. I ask why not thin a little heavier this entry in order to insure meeting your long term desired condition without having to deal with these issues in the future. This could also add more value to assist with economic viability for the project."

Response: Please refer to response to comment 3.1h on p. 65.

c. "There is some evidence in the scientific literature that large-diameter snags and down logs may actually dampen fire intensity by providing shade, reducing surface winds and acting as moisture reservoirs. Forest Service research on dry forest sites in southwest Oregon has shown that even during prolonged periods of drought, large amounts of water may be stored in the interior of large down logs (Amaranthus et al. 1989). Consequently, this stored water in the interior of logs, coupled with the shade that snags and downed logs provide, can raise the relative humidity of micro-sites, thereby promoting greater moisture retention in adjacent live vegetation and dead fine fuels. In effect, large downed logs with stored interior water and snags can retard fire intensity and rate of spread. (Countryman 1955; Amaranthus et al. 1989)."

Response: Rate of spread is more correlated with fine fuels than large fuels such as logs. While large logs do act as moisture reservoirs they will not significantly affect fire behavior if they are surrounded by fine ground fuels or ladder fuels. The moisture content of fuels is most influenced by solar insulation which in turn is most influenced by slope orientation to the sun (aspect) and slope position. The predominance of fuels treatments are on southerly aspects and upper slope positions where fuel moisture levels are relatively low irregardless of canopy cover. Snags contribute little to canopy cover since they occupy a relatively small area of the sky. Snags greatest influence on fires are to act as "Roman candles", spewing embers into the upper canopy and contributing to the potential for spot fires.

d. "The MIS Assessment reveals the near total lack of data and necessary underlying information needed to reveal accurate MIS population trends...Indeed other than the acknowledgment that 'little is known' about Red-breasted sapsuckers, the reader can located no statements whatsoever about distribution, abundance or population trends of snag-associated MIS species. The same lack of information regarding population trends is present for the vast majority of MIS species in the planning area."

Response: See response to Comment 1.1f and 1.1g, starting on p. 9.

e. "It appears that sensitive species surveys were only conducted for Goshawks, Northern Spotted Owls (NSO) Siskiyou Mountain Salamanders (SMS) and some species of molluscs. Nowhere in DEIS or project file in general, is there an explanation for why theses surveys cannot be conducted for sensitive and MIS species such as Acorn woodpeckers, Western gray squirrels, White-headed woodpeckers, Vaux's swifts, Downy woodpeckers, Pileated woodpeckers or Black-backed woodpeckers. These 'snag associated' MIS species will lose habitat due to proposed logging of snags in logging units, in proposed road locations, in landings, and along haul routes. Population numbers and trends have not been analyzed by the agency. This is particularly troubling given that the DEIS (3-18) anticipates a drastic reduction in snags greater than 16" across the project area in the 50 years following the timber sale. The DEIS (3-73) further acknowledges that 'Thinning to create DFPZs and construction of temporary roads may impact snag-associated species habitat by removing large-diameter trees (>20"), snags and DWD.'"

Response: See response to Comment 1.1f on p. 9.

One commenter suggested that the Forest misunderstands the role of dead and dying trees in LSR habitats.

f. "DFPZs, SNAGS AND LATE SUCCESSIONAL HABITAT. Please note that page 2-17 of the DEIS indicates that the Forest Service intends to log large (20"+) trees in the LSR in instances where 'a tree shows obvious signs of insects, disease, or poor vigor which indicate that the tree is likely to die and become a snag.' The agency misunderstands the role of large diameter dead and dying trees in contributing to the late-successional forest characteristics that the Mt. Ashland LSR is supposed to provide.

Response: The Forest identified a potential need to remove 20 inch trees that are likely to die and become a snag only in proposed DFPZ units. Removing a few larger live, but based on phenotypic condition, likely to soon die (10-20 years) trees, precludes the need to re-enter these areas in the near future, helps allow the DFPZ to function as desired. The purpose of removing these trees is to reduce the recruitment of surface fuels and to open the canopy, enabling the DFPZ to meet their objectives over a longer time frame. Because these types of trees provide structural diversity and are important components of a LSR, prescriptions in habitat promotion units are designed to retain trees that provide unique habitat components, trees ≥20" in diameter, and snags at levels consistent with the *Mt. Ashland Late Successional Reserve Assessment* (USDA Forest Service 1996a). Therefore, these important late-successional characteristic will be retained across the landscape.

In response to comments received on the DEIS and in during public field trips, the Forest has made a change between DEIS and FEIS to include the following conservation measure: On DFPZs, large snags (>20") and groups of large snags will be retained unless hazardous to operations. If large snags (cull logs) need to be felled for safety reasons, they will be retained on site for large coarse woody debris.

3.6 UNDERSTORY FLORA (CODE 305)

Concerns for understory flora were mainly expressed in comments about impacts from ground based logging equipment in Sections 3.2 and 3.3.

3.7 SOILS (CODE 306)

Many respondents had concerns about impacts to soils from temporary roads, skid trails, and landings; quite often those concerns relate to subsequent perceived impacts to riparian areas and water quality.

a. "Please note that while temporary roads are often not counted toward road density figures, our organizations believe that road construction (temporary or not) often has long-term significant impacts to soil resources."

Response: For this project it has been assumed that temporary roads count as a loss of soil productivity. The acres of existing and proposed temporary roads are added to other impacts, such as detrimental disturbance and compaction from past tractor logging, when determining the cumulative effects on the soil resource. The effects on soils are analyzed in the FEIS Section 3.5.3. The changes to road density as a result of spur construction are discussed in Section 3.2.2.

b. "The Beaver Creek watershed is already impacted by far too many roads that are bleeding sediment into the Creek with each rain, and the soils in this region are extremely vulnerable to erosion. The Forest Service's own staff have identified other means to achieve the desired thinning and fuels reduction without offsetting those benefits through the most destructive impact on watersheds in the west, namely road building."

Response: see response to Comment 2.1f on p. 55.

c. [EPA] "We support the use of existing roads, skid trails and landings, and the use of Wet Weather Operation Standards for the operation of equipment during ground-based operations. However, we are concerned that there will be circumstances that require crossing a riparian area with a skid trail. While techniques such as water-barring and the use of mulch on the last 25' of the skid trails will minimize soil erosion, some sediment releases will occur in riparian areas. In addition, it will be necessary to add fill and install culverts to some of these riparian area skid trail crossings. While the EIS states that the riparian reserve will be restored including restoring pre-project channel configurations, disturbances in these areas will result in impacts to the riparian areas.

The EIS states that soil that leaves skid trails is unlikely to reach streams due to the filtering capacity of the riparian reserves. However, it does not discuss or evaluate the direct impacts these skid trails will have on streams associated with the addition and removal of fill and culverts. The EIS needs to discuss in detail the direct impacts associated with the construction and restoration of skid trails in riparian areas. In particular the EIS needs to evaluate the impacts from the addition and removal of fill and culverts used for skid trails in riparian areas."

Response: See responses to Comments 1.9a on p. 37, 1.9o on p. 45, and 3.1e on p. 64.

d. [NOTE: Contradiction pointed out by the respondent] "In addition to the activities in riparian reserves discussed above, despite the fact that the Beaver Creek Watershed is at 'increased likelihood of cumulative watershed effects' (DEIS 3-131) the proposed action nevertheless calls for:

1. 40 new landings, permanently compacting soils and removing vegetation from 25 acres (DEIS 3-134);

2. 1,202 acres of 'ground based mechanical yarding [that] will compact soils from repeated passes of track or rubber-tired skidders on existing and new skid trails and temporary roads.' (DEIS 3-135);
3. The construction of 'temporary spur roads [that will] result in short-term loss of vegetative cover, soil displacement and compaction.' (DEIS 3-134);
4. The use of slashbuster masticators on steep slopes. (DEIS 2-18);
5. Crossing streams and riparian reserves with slashbuster masticators. (DEIS 2-23;
6. Placing fill in riparian features in order to facilitate the use of heavy equipment. (DEIS 2-23);

7. Please note that while both 3-139 and 2-23 of the DEIS assume[s] that heavy equipment will be used in riparian reserves and in riparian features, and that yarding corridors may be located through these reserves, page 2-20 of the DEIS inexplicably contends that '[h]eavy equipment will not be used within 170' of streams and riparian treatments will not reduce canopy cover ...'"

Response: See response to Comment 3.1d on p. 63.

e. "There have been no studies performed or proposed on the effects the Slashbuster has on soils. The Slashbuster had to be pulled out of a unit in the Ashland Watershed Protection Project in this same LSR due to soil displacement. Soil compaction could also happen as a result of Slashbuster use on certain soil types.

The use of the Slashbuster in certain areas could be altering hydrologic processes. Soil compaction, for example, is known to retard soil porosity and possibly increase runoff and peak flows.

The widespread use of the Slashbuster may in fact alter soil nutrient cycling. How important nutrient cycles such are influenced by the use of the Slashbuster at the site level could be critical to the long-term site conditions. Soil biota is another important element of site level conditions that could be impaired by the Slashbuster. Lastly, the Slashbuster could harm mychorizal communities that are known to be important symbiots of many species."

Response: Soil Quality Standards, BMPs, and Wet Weather Operations guidelines are included as project design features in order to minimize the effects of masticators and compaction on soil porosity. during implementation of operations.

Soil monitoring since 2001 has shown that 31-75% of the soil surface within masticated areas remain undisturbed. Soil compaction from equipment tracks is generally considered slightly increased due to equipment making one pass over an area and because the equipment operates over the masticated material. More heavily compacted areas can occur in access trails used repeatedly by equipment entering and leaving the masticated areas. Areas that may experience heavy compaction are limited in extent, usually less than 5% of the masticated area. Soil compaction monitoring in sandy loam soils has shown that 1-3 passes of a feller buncher tracked machine increased soil bulk density but did not exceed the 10% detrimental compaction threshold (Laurent 2006a). In addition, the area with decreased macro-porosity, which are areas disturbed by machine tracks is not of sufficient area to measurably affect infiltration and runoff on a unit basis. Increases in runoff, which could occur, would probably not be measurable.

Monitoring since 2001 has shown that high levels of soil cover remain after mastication. The unit average post-mastication soil cover ranges from 87-99% and averages 95%. Masticated cover is highly effective in preventing erosion compared to less dense soil cover under brush vegetation.

Mastication increases the amount of fine organic materials in contact with the soil. This material can decrease transpiration and surface soil temperatures as well as increase soil moisture. There will be an increase in nutrient cycling from leaching and increased biological activities due to an increase in available fine organic materials. Mastication of nitrogen fixing plants may also release some of the fixed nitrogen in the below ground root nodules.

There will be a change in the soil biota to organisms that can digest larger materials. Changes in the forest floor materials, whether natural or man-caused results in changes in the soil biota. These changes are mostly in response to types of materials needing decomposition and temperature changes. Mychorizal communities will remain. As the plants are cut, their nutrient and water demands decrease, thusly decreasing the root system. There may be a short-term decrease in mychorizal activity, but this will quickly increase as root systems respond to vigorous plant regrowth.

Effects to mychorrhizal fungi species and the interactions with vascular plant species have been discussed in detail on pp. 15 through 24 of the Biological Assessment/Evaluation for Sensitive, Threatened, and Endangered Plant Species (Plant BA/BE) (USDA Forest Service 2007g). There are no Sensitive, Threatened, Endangered, or Survey and Manage plant or fungi mycorrhizal species present within the units proposed for masticator treatments.

There have been no specific studies done on the effects of masticator treatments on mycorrhizal plant communities, but they are likely to show similar or reduced effects compared to the effects of logging with heavy equipment. Studies that have collected data on the effects of logging on ectomycorrhizal (ECM) fungi have determined that the effects are closely related to the number of trees that are removed, and the size of canopy gaps that are created. Thinning harvest prescriptions that retained living trees and shrubs and reduced the size of gap openings showed reduced effects by providing adequate underground linkages for ECM fungi (Amaranthus et al. 1994). Within the thinning stands proposed for masticator treatments in this project, adequate live trees would be retained and would provide shade to the site to retain moisture. A diversity of conifer, hardwood and shrub species, although more widely spaced, would be retained within the stands and would provide host trees for mycorrhizal fungi species. Because there is low ground pressure per square inch and minimal ground disturbance from a masticator as it travels over the wood fragments it has created, the effect on existing ECM fungi are likely to be insignificant. Underground mycorrhizal connections are only severed if soil is disturbed below the level of bare

mineral soil. Because adequate litter and duff levels will be maintained within the units to reduce soil erosion, these fungi/vascular plant mycorrhizal connections will be preserved.

Some responded that unnecessary restrictions were being placed on equipment use:

g. "Ground based equipment is restricted to slopes less than 35%. The DEIS states that equipment such as masticators and grapplers can work on slopes up to 45%. I ask why mechanized harvesters that have similar mechanics to the masticator and grappler can't be allowed to work on slopes up to 45% during harvest operations. It has been shown that mechanized harvesters have significant less soil impacts than those of dozers."

Response: See response to Comment 3.2o on p. 72.

3.8 NOXIOUS WEEDS (CODE 307)

a. "I am a register Wetland Scientist, I oppose the building of new roads in the Beaver Creek watershed, because these new roads will create disturbance and degrade the quality of the watershed through erosion and the introduction of invasive species. Fuel reduction and thinning are practical without new roads."

Response: There will be no new system roads constructed as part of the project. Temporary spur roads are proposed in the action alternatives with number of miles ranging from 1.7 in the Preferred Alternative to 6.86 in Alternative 2. All proposed roads have been visited by the project Geologist and Hydrologist. The effects of spur construction on soils and water quality are discussed in the FEIS in Chapter 3. Overall, water quality and beneficial uses will be maintained in the short-term and the project will have beneficial effects in the long-term. The project is consistent with Basin Plan direction and State and Federal water quality laws.

Impacts to noxious weeds from the Proposed Action have been summarized in Section 3.6.3.3 of the FEIS. Site specific impacts have been fully disclosed and analyzed on pp. 6 through 10 of the Noxious Weed Risk Assessment (USDA Forest Service 2007d) and on pp. 7–8 of the Addendum to the Noxious Weed Risk Assessment (USDA Forest Service 2007k). The Risk Assessment determined that there was a low risk of noxious weed introduction or spread. Noxious weed surveys were conducted in 2002 (USDA Forest Service 2002b) and in 2005 (USDA Forest Service 2006d). There are no California Department of Food and Agriculture (CDFA) "A" rated species documented within the project area. These are the species of greatest concern and for which the Klamath National Forest noxious weed program aggressively monitors and treats by hand-pulling methods. There is one documented site of a CDFA "B" or "C" rated species (yellow starthistle) located just outside the project area. "B" and "C" rated species, which are more widespread and of lesser concern, are monitored on a yearly basis, and hand-treated if within one mile of a wilderness area, within Threatened, Endangered, or Sensitive plant habitat, or within special management areas.

Mitigation measures designed to prevent the introduction of noxious weeds have been included in the project design. Road construction can introduce noxious weeds though contaminated soil present on equipment. In order to prevent this, heavy equipment will be cleaned of all weed seed containing material prior to entry onto National Forest lands. The disturbed soil of new temporary road construction areas can provide seed beds for weed invasion from adjacent areas. This is not likely when heavy equipment is cleaned prior to entry, and the temporary roads are closed and decommissioned after use. The on-going inventory, monitoring, and treatment of noxious weed will continue on the Forest, and monitoring of the Mt. Ashland LSR project area will be incorporated into the monitoring plan for noxious weeds. All CDFA "A" rated species that are discovered within the project area will be immediately treated by hand-pulling methods. If CDFA "B" and "C" rated species are discovered within the project area, these sites will be documented and treated if they threaten wilderness, TES, or special habitat areas.

b. "The rampant spread of noxious weeds is a growing problem for the forests of Northwestern California and Southwestern Oregon. The widespread use of the Slashbuster could facilitate the spread of noxious weeds. Seeds of invasive plant species could be spread on the machinery itself, or the treatment units could be prime sites for many 'pioneer' invasive and noxious weeds."

Response: See response to Section 3.8a on p. 85.

3.9 MISTLETOE (CODE 308)

a. "The DEIS (3-36) acknowledges that '[t]rees infected with mistletoe may be removed…' but the DEIS fails to quantify or analyze the impacts of mistletoe logging.

1. You must disclose positive ecological benefits of dwarf mistletoe. The DEIS did not disclose the full benefits of dwarf mistletoe to a late-successional forest ecosystem. The fruit, foliage and pollen of dwarf mistletoe are a food source for numerous bird, mammalian and insect species. Dwarf mistletoe alters the growth patterns of infected trees, creating structural complexity within forests in the form of witches brooms and especially snags, both of which are used by numerous wildlife species (including spotted owls) for nesting, roosting and cover. In general, dwarf mistletoe only becomes a problem when land managers attempt to make highly productive forests or tree farms grow timber far in excess of historical production rates (Pollock and Suckling 1995)."

Response: See response to Comment 1.8q on p. 32.

b. "Logging spreads dwarf mistletoe. Logging practices contribute to the spread of dwarf mistletoe. When soils are disturbed and ground cover is removed during logging operations, stand densities increase because pine seedlings readily germinate and grow on bare mineral soil. Such disturbances are particularly prevalent when heavy machinery is used to remove trees.

Thinning large trees that host mistletoe is not the best way to improve stand health because under normal ecological conditions, there would be minimal tree regeneration (and thus minimal new infections) near

infected trees because of fires and competition from grasses. Removing large trees creates a forest that is quite unlike anything that historically existed.

Logging may increase mistletoe in the remnant stand, not decrease it. Many mistletoe seeds that infect host trees do not readily produce aerial shoots; these are known as 'latent infections' (Knutson and Tinnin 1980). After thinning, 90 percent of all latent infections will appear within five years (Shea 1964).

To really reduce mistletoe, further logging would be necessary after this entry; the DEIS fails to disclose that fact. Also, mistletoe seed production will increase with improved nutrition of the infected leave trees. More open stands will promote regeneration, and the new trees can become infected by the mistletoe seeds. Moreover, increased mortality can occur in the remaining overstory trees; some heavily infected trees are not able to adjust to release from competition (Knutson and Tinnin 1980). The DEIS fails to disclose this.

We are particularly perplexed about the agency's proposed treatment of mistletoe in this LSR given that the DEIS (3-14) found that 'stand level infections are currently low.'"

Response: See response to Comment 1.8p on p. 31.

The proposed treatments include thinning from below which concentrates on removing the smaller trees in the stand, and retaining trees over 20" in DBH.

Initially there can be a flush of new mistletoe plants from latent infections. However, after about six years the pattern of dwarf mistletoe propagation is reversed. They may become fruitful but do not overcome their hosts (the conifers) for a number of reasons. Seed dispersal is from within the crown of the tree not from above in adjacent trees, so it is against gravity rather than with it. Susceptible branch tips are shielded by older needles from dwarf mistletoe in the crown. Trees are growing rapidly in height and forming new crown above the dwarf mistletoe, which is substantially screened in situ within the old hollow crown by dense shoots and foliage that developed right after thinning (Roth and Barrett 1985).

Latent infections are most likely to occur on trees that are severely stressed, such as those in dense, suppressed stands (Knutson and Tinnin 1980). The phenotypic traits of trees to be retained are not those commonly found in severely suppressed trees. It would be the larger, more disease free, better height growing trees that would be retained. Thus fewer latent infections are likely to exist. More importantly though is the fact that the thriftier trees will be retained and can outgrow the infection that may still exist in the tree.

4. FIRE AND FUELS

4.1 TREATMENT OF ACTIVITY FUELS (FUELS THROUGH VEGETATIVE TREATMENTS) (CODE 401)

Some respondents related the treatment of activity fuels to local economic benefits:

a. "This can be contrasted with the finding in the DEIS that unlike masticated stands, hand piled and underburned units remain more fire resilient over time. We strongly urge the agency to provide local employment via hand pile and burning treatments instead of mechanical mastication, particularly on steep slopes and within riparian reserves in this impaired watershed."

Response: This is a valid opinion which will be considered in the decision making process; however, there is an economy of implementation which must also be considered as well. All of the action alternatives provide opportunities for local employment through contracts for timber harvest, hand-piling, underburning or use of masticators. The Preferred Alternative includes 981 acres of hand-piling and 3,747 acres of underburning which would provide jobs for several years. Between DEIS and FEIS, the use of masticators has been limited to slopes ≤35% and use of masticators has been reduced in the Preferred Alternative when compared to Alternatives 2 and 5.

4.2 FIRE BEHAVIOR (FUEL BREAKS; FIRE SEVERITY; DENSITY MANAGEMENT; FIRE HAZARD) (CODE 403)

Some of the comments received questioned the effectiveness of the treatments in affecting stand-level fire behavior in a desirable way.

a. "The DEIS (3-86) anticipates that for 3 to 5 years after logging 'many proposed treatment stands would also be best represented by a slash fuel model' [and that] this fuel model would display [the] worst case for fire behavior. The KNF knows that both the Yellow fire (47,500 acres) and the Specimen fire (7,000 acres) originated in logging slash. Hence the widespread creation of logging slash may directly inhibit the attainment of the project's purpose and need."

Response: Please refer to response to comment 1.4c on p. 15.

b. "Time and Fire Severity. Fire severity may diminish in mixed evergreen forests as the duration of fire return increases. Odion et al. (2004) studied fire severity patterns in the 1987 Klamath fire complex and learned that structurally diverse mature forests with closed canopies overwhelmingly experienced low and moderate severity fire effects (up to 13 percent high severity -- expressed as tree canopy mortality due to data limitations). ...the researchers conclude that long absence of fire predicts low-severity fire effects in closed canopy mixed evergreen forests of the Klamath Mountains ...the assumptions presented in the no action alternative (DEIS 3-100) simply ignore the peer-reviewed literature referenced above while the response to scoping comments found in Appendix G at 4-29 repeatedly claims that despite the findings of the literature that issues surrounding thinning and fire severing are 'conjectural and not supported by factual evidence.'"

Response: The majority of proposed treatment areas in the Mt Ashland LSR Project Area are best characterized as dry mixed conifer forests and not the mixed evergreen forest as reported on by Odion et al. (2004). The mixed evergreen forest in the area studied by Odion et al. (2004) has a significant component of understory hardwoods, notably tanoak *(Lithocarpus densiflorus),* which does appear to negatively correlate with fire severity. The distribution of the mixed evergreen forest also positively correlates with higher annual precipitation and reduced evapotranspiration stress, thus higher fuel moistures are to be expected in the mixed evergreen zone compared to the mixed conifer zone found in more interior settings. This is also the most common zone of fire weather inversions, a very large determinant of fire behavior. Odion et al. (2004) also used BAER fire severity maps in their analysis; these maps are based on soil cover estimates post-fire and are not a true measure of effects of fire to forest canopy (Safford et al. 2007). Time since severity corresponds with diameter of trees also, and in that respect there is a relationship of reduced severity since larger trees are more fire resistant. Stands within the Project Area have been logged in the past and consist mainly of small diameter early or mid-mature forest; trees greater than 20" dbh will be retained. Treating ladder fuels and ground fuels in early to mid-mature stands, as proposed, increases the probability of stands progressing toward late-mature and old-growth seral stages as desired in an LSR

c. "The EIS should fully address the potential for reduced canopy closure to increased solar radiation, ground level wind speed, surface fuel moisture and flammability to result from proposed density management. The DEIS (3-90) did acknowledge that '[d]ense canopies may contribute to crown fire spread but also reduce the amount of wind reaching the surface and may contribute to an increase in fine fuel moisture due to the shaded conditions.' Yet these findings are not reflected in bulk of the conclusions presented regarding effects of the no action alternative."

Response: Please refer to response to comment 2.2a on p. 56.

d. "Density Management and Fire Hazard. Traditional silvicultural tools are constructed to produce wood crops, not prevent high intensity fires, and quantitative methods necessary for creating and maintaining stands resistant to canopy fires are lacking (Keyes and O'Hara 2002)."

Response: Traditional silvicultural metrics and tools are valid to address fuels issues. Silviculture metrics quantify distribution and abundance by size class and species within stands and these are expanded to landscape scale metrics with statistically sound inventory methods. These measures are routinely used to calculate canopy bulk density and height to live crown, important components of predicting fire behavior. For the last two decades forest inventory plots have also been used collect information on downed woody material, thus providing quantifiable information on ground fuels.

Many of the commenters were skeptical about the use of fuels breaks:

e. "Attached to these comments you will find a published, peer-reviewed paper by Dr. Tim Ingalsbee entitled Fuelbreaks for Wildland Fire Management: A Moat or a Drawbridge for Ecosystem Fire Restoration. This paper raises numerous issues regarding fuelbreak construct that are of concern to our organizations and our memberships. Some of those concerns are: The need to reconceptualize fuelbreaks; location; dangers of canopy removal; and maintenance."

Response: Please see response to comment 1.8b on p. 25.

f. "Fuelbreaks are clearly and specifically designed for fire suppression actions--this is where firefighting is intended to occur. Accordingly, the environmental impacts of firefighting in fuelbreaks must be specifically analyzed and explicitly disclosed. Such analysis did not occur in the DEIS."

Response: Please see response to comment 1.1b on p. 6.

g. "Fuelbreaks are inappropriate for this watershed...Fuels reduction within fuelbreaks/flanks benefits only those sites, while existing hazardous fuel loads outside of fuelbreaks/flanks remain untreated and susceptible to severe fire effects during extreme weather conditions. The analysis for the Herger- Feinstein Quincy Library Group Forest Recovery Act disclosed current research findings from Dr. Mark Finney that disputes the efficacy of linear fuelbreaks, and instead, favors area-wide treatments primarily with prescribed underburning."

Response: The DFPZs are designed to facilitate prescribed burns and implementation of appropriate management response and wildland fire use. They are not intended to stop fire as linear fuel breaks are often intended, but rather to lessen fire effects at a landscape scale.

h. "Fire Behavior. Our organizations are very interested in learning about the impacts of slashbuster treatment on such 'fire variables' as residence time, short-term fuel loading, long term vegetative response, and microclimatic conditions on the site. Such information is simply absent from the DEIS."

Response: Please see response to comment 1.8v on p. 34.

At least one comment expressed support of the project in the interest in restoring stand structure with the eventual goal of maintaining stand structures through fire use. Others expressed general support for the project and reducing fire risk.

i. "As stated in our scoping comments of 10/28/05, our organizations are generally supportive of the proposal to conduct thinning-from-below and underburning activities in dense second-growth white fir stands within the Project Area. It is our hope that such thinning will help to re-establish the historic species composition of these stands and allow for re-introduction of fire into this fire evolved and fire dependent ecosystem. The fact that the vast majority of these stands have been previously logged heavily influences our general support for the silvicultural prescription."

Response: Positive comment; no response needed.

j. [EPA] "The area is densely forested, has a high concentration of fuels, a high incident of shade-tolerant species and is less spatially complex making it less sustainable and highly vulnerable to high intensity fires. We support the Forest Service's efforts to reduce the threat of catastrophic stand-replacing wild fires and

restore and maintain late–successional forest habitat for late successional forest related species including the Northern spotted owl in the Mr. Ashland project area."

Response: Positive comment; no response needed.

k. "My folks purchased a piece of land back in the early 60's, where Grouse Creek and Cow Creek meet and the tree were young and the vegetation was thin. Now the trees are so tall and the forest is so much denser. This in combination with dry summers makes a very dangerous situation for a forest fire."

Response: This observation is corroborated in purpose and need and analyses of the fire and fuel conditions in the EIS; no response needed.

5. AQUATIC RESOURCES

A large majority of the comments on aquatic resources impacts focused on cumulative impacts. Many of those comments are found in Section 1.9. Additionally there are several comments about impacts to watershed resources from harvest systems (see Sections 3.2 and 3.7).

5.1 IMPACTS TO AQUATIC RESOURCES (INCLUDING AQUATIC CONSERVATION STRATEGY AND NORTH COAST WATER QUALITY CONTROL PLAN) (CODE 500)

Some respondents questioned the compatibility and compliance of the project with the North Coast Water Quality Control Plan (WQCP), the Aquatic Conservation Strategy (ACS), and the Clean Water Act. Some also requested that data be presented to demonstrate compliance with the WQCP and ACS.

a. "Even with the questionable outcomes alleged by the KNF for this timber sale, the intent of the North Coast Water Quality Control Plan (WQCP) would be violated. [NOTE: Referenced in DEIS?]...The DEIS does not contain any hard data or evidence to support the conclusion that the WQCP objectives will be met by this project. By failing to provide data or evidence to support a conclusion, the DEIS violates NEPA. By failing to provide any evidence that water quality objectives outlined in the Basin Plan are currently being met, that beneficial uses are being protected, and that the proposed timber sale will not violate those objectives, the DEIS fails to demonstrate compliance with the Basin Plan, and violates NEPA's requirement that Federal actions do not threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment."

Response: Please refer to response to comment 1.1h. on p. 11.

b. "The DEIS nevertheless calls for a number of practices known to harm water quality and inhibit attainment of the objectives of the ACS and of the CWA requirements of the Basin Plan."

Response: ACS Objectives are discussed in the FEIS in Section 3.4.3, how the ACS objectives are being met is in the Appendix to the Watershed Report (B. Thomas and Snavely 2007). Please refer to response to comment 1.1h. on p. 11 for a discussion on CWA requirements.

5.2 WATERSHED (HYDROLOGY; WATER QUALITY) (CODE 501)

Many of the comments on watershed impacts referred to Forest Plan Direction which is covered in Section 1.6. One commenter said the DEIS fails to address causes of, and indeed furthers causes of watershed impairment.

a. "...none of the action alternatives address the cause of the problem, and in fact, all of the action alternatives call for creating more canopy openings (via road construction, landing construction and group selection logging), logging more large trees (in the DFPZ and for road and landing construction), constructing temporary roads in impaired watersheds and continuing a policy of full fire suppression. Hence the action alternatives all increase the risk of peak flows, surface erosion and landslides in the AWWC and fail to address the cause of the watershed impairment."

Response: See response to Comment 2.1e on p. 54.

Another commenter said that the watershed indicators not explained well and requested clarification on the definition of 'risk ratio':

b. "Section 3.4.1.1, Watershed Effects Indicators, page 3-122, second paragraph

It would benefit the reader if an explicit definition of how the 'risk ratio' is derived and if the quantities being compared could be provided for each of the three models. This would help the reader assess how much weight to place on values that are just over, or just under, the tipping point of 1.0 compared to values that are far from 1.0. In addition, the original values for risk ratios for current conditions (Table 3-29 on page 3-131) should be repeated on Tables 3-31 through 3-33, which show change in risk ratios. This would allow the reader to quickly add the change to the original value to better assess potential impacts of the alternatives."

Response: Please refer to response to comment 1.8e on p. 27.

Some comments mentioned the concern for impacts of the project on increases in flow, temperature, sediment loading, stream chemistry, and landslide risk:

c. "Practices such as felling, ground-based yarding, roading and landing construction occur on relatively small units. These activities lead to changes in site processes such as increases in snow accumulation, snow melt rate, surface erosion, and landsliding. During a single large flood event, these individual alterations collectively may lead to substantial increases in streamflow and erosion downstream. Other types of basin cumulative effects include changes in water temperature, and stream chemistry."

Response: Please see response to comment 1.9l on p. 43.

d. "IMPAIRED WATERSHEDS IN AREAS WITH WATERSHED CONCERNS (AWWC)...all of the proposed action alternatives call for new road construction, group selection logging, and ground based yarding that can increase peak flows, sediment loading and landslide risk."

Response: Please refer to responses to comment 1.9k on p. 41, 2.1d on p. 54 and 2.7b on p. 60.

Project activities are not likely to increase landslide risk. This is because: a) all proposed temporary roads and landings avoid unstable areas, and would be constructed to design standards specified in the Geologic Resource Protection Measures (de la Fuente 2007, 6); b) project openings and yarding would avoid unstable areas; and c) no group selection logging is proposed.

e. "I would also urge great care in logging and yarding trees through fragile streamside areas. This project, when considered with the past cumulative effects of logging and road-building activities in the area - sedimentation, fragmentation, and disturbance of wildlife habitat among other things - would continue to erode the health of not only Beaver Creek, but also, the Klamath River."

Response: There will be no yarding in fragile streamside areas; see responses to Comments 1.9a on p. 37, 1.9e on p. 38, and 1.9o on p. 45.

Some of the respondents had concerns over the use of ERA methodology, pointing out both its use in other areas and potential misuse:

f. "The nearby Rogue River/Siskiyou National Forest is proposing a HFRA fuels and habitat project called the Ashland Forest Resiliency (AFR) Project in the same LSR as your proposed project. Please note that the DEIS for that HFRA project concludes that the Equivalent Roaded Area (ERA) Methodology is a direct indicator of cumulative watershed effects that can adversely affect the rate, movement and timing of the transport of water and sediment. Please see Ashland Forest Resiliency DEIS at III-43. It is for this reason that the Rogue River National Forest is electing to implement their HFRA LSR project without constructing any new logging roads. Hence it is reasonable to develop (and implement) an action alternative to achieve the purpose and need for your project that does not require new road construction through this LSR."

Response: Please refer to Cumulative Watershed Effects Specialist report (Elder 2006) for the impacts from both proposed and existing roads.

An alternative that does not include temporary spur roads was developed and was eliminated from detailed study (Alternative 3). A description of that alternative and the reason it was not carried forward can be found in Chapter 2 of the FEIS in Section 2.3.2 (refer to response to Comment 2.6b on p. 59)

Alternative 5 and the Preferred Alternative also address this issue. These alternatives were designed to minimize spur construction while meeting the purpose and need. Neither alternative increases the modeled ERA risk ratio for Beaver Creek a substantial amount (.07 and .09 respectively) and both are under the threshold of concern (.86 and .85) (Elder 2006; Bousfield et al. 2008; Snavely 2007a). The Preferred Alternative further limits spur road construction to ridges and upper slopes . These ridge-top and upper slope spurs are needed to implement prescriptions for DFPZs and to meet the purpose and need for DFPZs. The core IDT and a fuels contractor considered dropping an additional spur on the Siskiyou Gap DFPZ (T317 A and B) and determined that without the spur access to the ridgeline, the treatments as designed could not be implemented and the DFPZ function would be compromised (Journey pers. comm.). By not implementing the Siskiyou Gap DFPZ, the purpose and need would not be attained. Rather than drop the spur entirely, it was modified to minimize effects to NSO foraging habitat. The remaining spurs in the Preferred Alternative are minor (<.14 mile) ridgeline extensions needed to provide access or deflection for cable yarding. The spurs provide access to roughly 52 acres in four areas and increase the effectiveness of fuels reduction and habitat promotion treatments.

g. "Our organizations have significant concerns regarding the ERA/TOC methodology in the DEIS. In many watersheds, peak flows rise in a curvilinear fashion with increased road density and logging (Grant 1988), rather than failing to change until after a threshold of forest clearing has been reached (NMFS 1997). Hydrologic impacts may appear when less than 20 percent of a watershed is clearcut. Empirically, peak

winter storm flows increased 13 percent after 19 percent of a coastal British Columbia watershed was clear-cut (Golding 1987)."

Response: The R-5 generic ERA/TOC method would assign a Threshold of Concern (TOC) of 12% to all watersheds within the project area. This implies that 12% of the area could have disturbance before peak flow impacts may be starting to occur. The Klamath model allows each watershed to assign it's own TOC. TOC is calculated based on channel sensitivity, beneficial uses, soil erodibility, hydrologic response, and slope stability of each watershed. Within the project area TOC ranges from 6-8% disturbance level as expressed in equivalent roaded acres.

The rising arm of a hydrograph is more of a logarithmic function of runoff peaks, with the falling arm is much more curvilinear, reflecting the time that the peak runoff takes to return to bankfull discharge. It does not rely on a threshold to activate. The TOC in the ERA/TOC model is the point at which peak flow impacts may be beginning to be observed.

5.3 SOURCE WATER (DRINKING WATER) (CODE 502)

The EPA provided a few comments specifically on source water and drinking water. They requested that any source water areas be identified and that any impacts be properly disclosed:

a. [EPA] "The EIS needs to discuss the actions were taken to identify all federally-regulated and state regulated source water protection areas, within and downstream of the project area. If source water protection areas will be impacted by the proposed project, the EIS needs to discuss what those impacts may be and the measures that would be taken to protect them."

Response: Please see response to comment 1.8d on p. 27.

b. [EPA] "We have assigned a rating of EC-2 (Environmental Concerns - Insufficient Information) to all the alternatives presented in the EIS. This rating and a summary of our comments will be published in the Federal Register. We have concerns with the impacts from ground-based silviculture treatments, the impacts from the temporary road spurs that will be constructed and the cumulative watershed effects. Additional information is needed on the impacts associated with the skid trails that will be constructed in riparian reserves and potential source water protection areas within and downstream of the project area."

Response: Please see response to comment 1.9e on p. 38.

5.4 RIPARIAN AREAS (CODE 503)

Several respondents are concerned about actions in riparian reserves, and yarding, skyline, and spur road construction in particular.

a. [EPA] "While the EIS states that the construction and use of the temporary spur roads will have minor impacts on habitat, impacts under Alternative 2 are the greatest due to the number of road spurs that will be constructed under this action alternative. To minimize impacts from the construction and use of road spurs

we recommend that the Forest Service select the alternative that will have the least amount of road spurs (Alternative 5 with 9 road spurs) and avoid construction of road spurs that cross streams and riparian areas."

Response: The KNF agrees that impacts from spur roads are more likely to occur under Alternative 2. The Preferred Alternative was developed between DEIS and FEIS and has the least amount of spur construction.

The effects of temporary spur road construction are described in the FEIS in Chapter 3 by resource. Implementation of the project (including construction of temporary spur roads) will result in a minor increase in total road density during the life of the project but will result in a decrease in total road density after proposed decommissioning of roads (including all temporary spur roads) is completed (refer to Table 3-4 in the FEIS). The Preferred Alternative addresses the issue of temporary spur road construction by reducing miles of spurs constructed to 1.7 (from 6.86) and constructing spurs only on ridgetops and upper slope locations. There will be no spur construction in Riparian Reserves with the Preferred Alternative. There will be no timber harvest within Riparian Reserves in the first 170'. The 170' site tree distance buffer width is designed to protect steams. This is a de facto "equipment exclusion zone." Thinning may occur in the upland in the outer 170–340' of Riparian Reserves on less than 1% of the project area; there will be no equipment in riparian areas (wet areas), riparian vegetation, or inner gorges. Full suspension is required for yarding across riparian areas (BMP 1.11)

b. "The DEIS (2-23) acknowledges that: (1) skid trials and skyline corridors will cross riparian areas; and that (2) fill may be added to riparian features to facilitate such yarding activities. Yet the site specific locations and impacts of yarding through, and placing fill in, riparian reserves is not disclosed or analyzed in the DEIS. Indeed, the public and the decision maker are precluded from knowing the location, frequency, or impact of these activities."

Response: Please see response to comment 1.9o on p. 45.

c. "On page 3-139 (and 3-25, 3-28) of the DEIS the agency proposes constructing two spur roads within riparian reserves (and across the riparian features) and acknowledges (but does not analyze the impacts of) the construction of skyline corridors and skid trails within riparian reserves. Please note that the location, frequency and impacts of skyline corridors and skid trails within riparian reserves is not disclosed in the DEIS."

Response: Please see responses to comments 1.9o and 1.9p and pp. 45 and 46 respectively.

d. [EPA] "The EIS states that soil that leaves skid trails is unlikely to reach streams due to the filtering capacity of the riparian reserves. However, it does not discuss or evaluate the direct impacts these skid trails will have on streams associated with the addition and removal of fill and culverts. The EIS needs to discuss in detail the direct impacts associated with the construction and restoration of skid trails in riparian areas. In particular the EIS needs to evaluate the impacts from the addition and removal of fill and culverts used for skid trails in riparian areas."

Response: Please see responses to comments 1.9a on p. 37 and 1.9o. Neither perennial nor intermittent stream courses will be crossed by skid trails. Some ephemeral dry swales may be crossed at designated points. These ephemeral swales carry only snowmelt, not surfaced groundwater. The flow in these features travels a short distance downstream, before infiltrating into the soil. Any designated crossing of these features will have the flow way re-established to prevent ponding.

6. COMMENTS ON WILDLIFE AND FISHERIES

Respondents are concerned about a number of aspects of wildlife and fisheries. This includes field surveys and monitoring of Management Indicator Species (MIS); effects on critical habitat for spotted owls; mammals; and salamanders. Road building and road density are of concern due to sedimentation into streams and fragmentation of wildlife habitat. The EPA is supportive of this project's goal to restore and maintain spotted owl habitat, although they are concerned that new roads will have negative effects.

6.1 WILDLIFE AND FISHERIES RESOURCES (CODE 600)

The EPA is concerned that spur roads will further fragment and degrade habitat.

a. [EPA] "Temporary spur road construction will increase road densities, result in the harassment of wildlife and, increase edge habitat and habitat fragmentation. Increased edge habitat results in decreased interior forest exposing wildlife to increased sun and wind and potential vulnerability to external competition and predation. The project proposes to construct as many as 22 spur roads in the project area, two of which will cross streams and associated riparian vegetation. While the spur roads are temporary, and some areas will see some minor decreases in road density, road densities in the area are high. Post project road densities will still remain high (between 3.0 and 5.5 miles per square mile) and result in low habitat capability for deer, elk, marten and fishers. In addition, approximately 1.1 acres of late-successional forest and as much as 12 acres of mid-successional forest will be removed under the action alternatives due to the construction and use of the spur roads."

Response: Road density in the Project Area is current high based on wildlife habitat capability models (FEIS Section 3.2.2). The project will reduce the open-road density in the Project Area (FEIS Table 3-4) thus reducing open-road density in the Beaver Creek Watershed. The project will result in a minor increase in total-road density during project operations and will result in a decrease in total-road density at the conclusion of the project due to decommissioning of both temporary spurs and a system road (FEIS Section 3.2.2). The effects of spur road construction on wildlife are disclosed in the FEIS in Sections 3.2.2 through 3.2.28. The Preferred Alternative addressed this issue by reducing proposed temporary spur construction to 1.7 miles.

Another respondent commented about the need to support the wildlife section with more references to support statements of fact.

c. "Section 2.3.2.1, Wildlife, pages 2-19 through 2-20; and Section 3.2, Wildlife and Habitat, pages 3-21 through 3-79. There are many statements of fact about species and statements that reference surveys conducted for species in the analysis area. While some of these statements have supporting documentation, many do not. Statements of fact about species, statements regarding the effects of the proposed action on species, and statements on previous studies on species need to have supporting references. For surveys, citations should be provided wherever feasible and when these are not available, information should be

provided such as who conducted the survey, when it was done, and where results can be found, even if results are stored in project files. Examples of where these citations should be provided include:

1. 'If surveys indicate that the Flystain historic site is not occupied by breeding Goshawks, seasonal restrictions may be waived.' (page 2-19)

2. 'If surveys indicate that suitable habitat is not occupied by great gray owls, seasonal restrictions may be waived.' (page 2-20)

3. 'Most recently, the first year of two-year protocol surveys [for NSOs] was completed for the entire Project Area in 2006. These surveys indicate that ... young.' (page 3-41)

4. 'In the long term, thinning treatments are expected to benefit marten by increasing the amount and distribution of denning and resting habitat as well as provide complex structure near the forest floor.' (page 3-56)

5. 'Habitat for Siskiyou mountains salamanders in the Project Area is limited to isolated pockets of shaded talus.' (page 3-64)

6. 'Surveys for this species [Siskiyou mountains salamanders] adjacent to the Project Area failed to detect the presence of Siskiyou mountains salamander. Pre-disturbance surveys for Siskiyou mountains salamander were conducted ... respectively.' (page 3-64)"

Response: Please see responses to comments 1.1f (p. 9), 1.6i (p. 20), 1.8j (p. 28, and 1.8k (p. 29).

6.2 MANAGEMENT INDICATOR SPECIES (CODE 601)

Responses in this section are related to survey and monitoring techniques for MIS species, which in turn affects the cumulative effects analysis for those species. A group of respondents challenge the interpretation of monitoring requirements for MIS species:

a. "The following contention in the MIS Assessment (page 1) is flatly incorrect: 'The Monitoring Requirements in Chapter 5 of the Klamath National Forest Land and Resource Management Plan (LRMP) do not require population monitoring or surveys on MIS with the exception of steelhead trout and rainbow trout.' In fact (as recognized by the court in KS Wild v. USFS) the KLRMP (at 5-3) clearly states that '[P]opulation trends of the management indicator species will be monitored and relationships to habitat changes determined.' It simply doesn't get much clearer than that. Hence the court in KS Wild v. USFS ruled that in the Beaver Creek timber sale in the same watershed as this proposed project 'because the habitat of the Snag Species Association MIS may be appreciably affected, use of habitat as a proxy for population surveys was arbitrary and capricious.' Hopefully the Forest Service will not place our organizations in the position of requiring the court to issue the same opinion here.

Response: See response to Comment 1.1f and 1.1g on p. 9.

b. "Throughout the Wildlife BA/BE, EIS and ROD, the Forest Service makes conclusory statements regarding the cumulative effects on the threatened, sensitive, and management indicator species not based on adequate quantitative data. The Forest Service fails to address past, present, and reasonably foreseeable future actions effecting MIS in the project area. The USFS fails to substantively address the cumulative

watershed effects of all actions in the affected watersheds and the impact on MIS and instead discounts cumulative impacts as individually minor impacts without examining their collective significance."

Response: A cumulative effects analysis was completed for the aquatic MIS species in Part II of the MIS analysis for the project. Cumulative effects were discussed in the Fish BA. In-stream woody debris will not be significantly affected by the project. Riparian Reserve canopies and sediment filtration buffers will be intact at project completion and they will maintain existing habitat conditions (water quality) in the stream systems in the project area. Water temperatures will remain cool and suitable for salmonid life processes. The risk of increased flow effects, as measured by ERA/TOC, show potential but mostly minor increases in all four 7th fields (Elder 2006; Bousfield et al. 2008). Post-project flow regimes in all four subwatersheds are not expected to be different from pre-project flow regimes. Watershed improvement projects, such as road decommissioning actions, may result in a short-term minor increase in sediment to streams but overall, the process will result in long-term reduction in sedimentation. It should be noted that sediment modeling (USLE, GEO) predict project-related "sediment savings" will result with the completion of road improvement and decommissioning, resulting in improved substrate and turbidity condition in the mid to long-term (next 10-20 years). There are no expected long-term cumulative effects to rainbow trout and steelhead habitat or populations. It is expected that habitat quality will be improved in the long-term as a result of implementation of the project.

Cumulative effects to tailed frog, American dipper, long-tailed vole, and northern water shrew habitat are expected to be minimal because functioning riparian reserves will buffer sediment delivery to streams, thinning and fuels treatments will not impact instream habitat structure, and project design features and project specific BMPs will ensure that activities within riparian reserves will have minimal impacts. Additionally, at the scale of the Project Area, the amount of riparian habitat that may be removed or degraded on both federal and private lands is expected to be insignificant. Thus cumulative effects are not expected to impact the population trends for these species.

c. "The DEIS and MIS assessment for the Mt. Ashland LSR timber sale not only fails to provide monitoring information for all MIS species, but also fails to adequately analyze impacts to the black bear, American marten, Pacific fisher and Wolverine. Cumulative and direct impacts to pallid and Townsend's big-eared bats are not fully disclosed and analyzed. Population treads for these species were not disclosed."

d. "Management Indicator Species. The DEIS establishes that the Forest Service is relying on MIS habitat modeling and not conducting on the ground surveys as required by NFMA."

Response: See response to Comment 1.1f and 1.1g on p. 9.

e. "The agency does not provide any analysis or data on current populations of MIS to support its conclusion that the viability of these species is not likely to be threatened by the increased fragmentation from landing and road construction proposed in the timber sale. Please note that the DEIS (3-77) and MIS Report rely upon surveys that are over a decade old in analyzing impacts to avian communities."

Response: See response to Comment 1.1f and 1.1g.

f. "The MIS Assessment reveals the near total lack of data and necessary underlying information needed to reveal accurate MIS population trends...Indeed other than the acknowledgment that 'little is known' about Red-breasted sapsuckers, the reader can located no statements whatsoever about distribution, abundance or population trends of snag-associated MIS species. The same lack of information regarding population trends is present for the vast majority of MIS species in the planning area."

Response: See response to Comment 1.1f and 1.1g on p. 9.

g. "It appears that sensitive species surveys were only conducted for Goshawks, Northern Spotted Owls (NSO) Siskiyou Mountain Salamanders (SMS) and some species of molluscs. Nowhere in DEIS or project file in general, is there an explanation for why theses surveys cannot be conducted for sensitive and MIS species such as Acorn woodpeckers, Western gray squirrels, White-headed woodpeckers, Vaux's swifts, Downy woodpeckers, Pileated woodpeckers or Black-backed woodpeckers. These 'snag associated' MIS species will lose habitat due to proposed logging of snags in logging units, in proposed road locations, in landings, and along haul routes. Population numbers and trends have not been analyzed by the agency. This is particularly troubling given that the DEIS (3-18) anticipates a drastic reduction in snags greater than 16" across the project area in the 50 years following the timber sale. The DEIS (3-73) further acknowledges that 'Thinning to create DFPZs and construction of temporary roads may impact snag-associated species habitat by removing large-diameter trees (>20"), snags and DWD.'"

Response: See response to Comment 1.1f and 1.1g on p. 9.

6.3 FISH HABITAT (CODE 602)

Comments related to fish were concerned with cumulative watershed effects, including soil erosion and stream sedimentation caused by road building.

a. "However useful site specific BMPs are in minimizing effects of individual actions, they still do not address the cumulative effects of multiple actions occurring in the watershed which, though individually 'minimized' through application of site-specific BMPs, may still be significant, in their totality, and have undesirable consequences for beneficial uses such as salmon populations and salmon habitat."

Response: please refer to response to comment 1.1d on p. 7.

b. "The analysis contained in Cuddy Mountain is quite similar to the KNF's summary dismissal of cumulative effects to anadromous fish in the DEIS."

Response: please refer to response to comment 1.9u on p. 47.

c. "this project should avoid actions like new road construction and ground based yarding which will contribute to sediment production and further limit salmonid reproduction."

Response: The number of and miles of new temp road construction and ground based yarding was kept to a minimum while still meeting the purpose and need of the project. All new temp

roads will be decommissioned upon project completion so no long-term contribution to sediment production from these roads is expected.

d. "Of particular concern is the highly unstable and erosive nature of the granitic and schist soils found in Beaver Creek. The Klamath was once the third-largest producer of salmon on the West Coast, and today supports only a fraction of that amount...Though the Klamath River and the environment surrounding it has suffered negative impacts related to logging, mining, and farming in the past, it is one of the last wild, beautiful, unspoiled areas in the U.S. and still supports the dwindling salmon populations."

Response: The proposed treatments will not change the amount of water reaching Beaver Creek and the Klamath River from the project area. The Fisheries Report and Fish Biological Assessment address potential impacts to fish species at length (B. Thomas 2007b). Analysis is conducted at the site, 7th field watershed, and 5th field watershed scales, and considers short and long-term effects. The Fisheries Report concluded that there would be no adverse effects and a low level of indirect effects to coho salmon, no loss of viability to steelhead trout and Chinook salmon, and no adverse affects to resident rainbow trout.

6.4 SPOTTED OWL (CODE 603)

The EPA supports this project for its potential to restore and maintain spotted owl habitat.

a. [EPA] "The area is densely forested, has a high concentration of fuels, a high incident of shade-tolerant species and is less spatially complex making it less sustainable and highly vulnerable to high intensity fires. We support the Forest Service's efforts to reduce the threat of catastrophic stand-replacing wild fires and restore and maintain late–successional forest habitat for late-successional forest related species including the Northern spotted owl in the Mr. Ashland project area."

However, another respondent feels the project may harm critical habitat for several species.

b. "Mechanical thinning proposals advanced by federal foresters in the Siskiyous routinely require incidental take permits to harass, harm or kill species listed as threatened under the Endangered Species Act. Several known pairs of northern spotted owl reside in the analysis area. To the degree that thinning opens forest canopies and eliminates multi-layered internal forest structure, it generally is not compatible with conservation of critical habitat for spotted owl or other sensitive species known to exist in the analysis area including Pacific fisher, pileated woodpecker and northern goshawk."

Response: The effects of the project on NSO, NSO Critical Habitat and Sensitive species are disclosed in the FEIS in Sections 3.2.4 through 3.2.20. The project will have insignificant short-term effects in order to accomplish the objectives of habitat restoration and fuels reduction. The project will have long-term beneficial effects on late-successional forest habitat and NSO Critical Habitat. The project is not likely to adversely affect NSOs (USDI Fish and Wildlife Service 2007b) and therefore a take permit is not required.

Inconsistency between effects as stated in the EIS and as modeled were reported by commenters:

c. "the DEIS (3-36) anticipates minimal cumulative impacts from this project on NSO habitat because 'a minimum of 60% canopy closure will be retained in existing nesting, roosting, or foraging habitat and 40% in dispersal habitat. Yet the modeled outcome for project thinning reduced canopy below 40% in every habitat type in the Project Area outside of the True Fir zone.' (DEIS 3-18)."

Response: Please refer to response to comment 1.8x on p. 36.

Covered previously

d. "Please note that while page 3-36 of the DEIS claims that 60% canopy will be retained in NSO NRF habitat and 40% in NSO dispersal habitat, the modeled post-project canopy range in the DEIS (3-84) is from 25% to 50% canopy cover. Which of these contentions is correct?"

Response: Please refer to response to comment 1.8x on p. 36.

6.5 MAMMALS (CODE 604) AND BATS (CODE 607)

Comments for mammals, including bats, are addressed in this section. Most responses were concerned with specific MIS species. Comments were related to deer, elk, black bear, marten, fisher, and wolverine. Road density, habitat fragmentation, and impacts analysis are of concern.

a. [EPA] "Temporary spur road construction will increase road densities, result in the harassment of wildlife and, increase edge habitat and habitat fragmentation. Increased edge habitat results in decreased interior forest exposing wildlife to increased sun and wind and potential vulnerability to external competition and predation. The project proposes to construct as many as 22 spur roads in the project area, two of which will cross streams and associated riparian vegetation. While the spur roads are temporary, and some areas will see some minor decreases in road density, road densities in the area are high. Post project road densities will still remain high (between 3.0 and 5.5 miles per square mile) and result in low habitat capability for deer, elk, marten and fishers. In addition, approximately 1.1 acres of late-successional forest and as much as 12 acres of mid-successional forest will be removed under the action alternatives due to the construction and use of the spur roads."

Response: Please refer to response to comment 6.1a on p. 98.

b. "The DEIS and MIS assessment for the Mt. Ashland LSR timber sale not only fails to provide monitoring information for all MIS species, but also fails to adequately analyze impacts to the black bear, American marten, Pacific fisher and Wolverine. Cumulative and direct impacts to pallid and Townsend's big-eared bats are not fully disclosed and analyzed. Population treads for these species were not disclosed."

Response: See response to Comment 1.9s on p. 47.

c. "Pacific Fisher. The discussion in the DEIS of the Pacific fisher is lacking. The USFWS warranted but precluded findings contain a detailed review on the conservation status of the fisher, including a comprehensive analysis of threats to the continued existence of the species. 69 Fed. Reg. 18770, 18770 (April 8, 2004). For example, FWS noted that 'habitat loss and fragmentation appear to be significant threats to the fisher. Forested habitat in the Pacific coast region decreased by about 8.5 million acres between 1953 and 1997.' Id. at 18780. 'Forest cover in the Pacific coast is projected to continue to decrease

through 2050, with timberland area projected to be about 6 percent smaller in 2050 than in 1997.' Id. 'Thus fisher habitat is projected to decline in Washington, Oregon, and California in the foreseeable future.' Id.

1. The FWS status review also discloses that '[v]egetation management activities such as timber harvest and fuels reduction treatments…can destroy, alter, or fragment forest habitat suitable for fishers.' Id. at 18778. 'A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and conversely prefers large areas of contiguous interior forest.' Id. at 18773. 'The fisher's need for overhead cover is very well documented. Many researchers report that fishers select stands with continuous canopy cover to provide security cover from predators.' Id. 'Fishers probably avoid open areas because in winter open areas have deeper, less supportive snow which inhibits travel, and because they are more vulnerable to potential predators without forest cover.' Id. 'Furthermore, preferred prey species may be more abundant or vulnerable in areas with higher canopy closure.' Id.

2. None of this scientific literature was discussed in the analysis of the proposed project."

Response: See response to Comment 1.8n on p. 30.

Several comments pertained to bat species, including one response concerned that the EIS inadvertently omitted information about bats.

d. "Literature Cited, pages 4-19 and 4-30

1. The following two references cited in the literature section do not appear within the main body of the DEIS, and a question arises as to whether important facts about the Townsend's big-eared bat got inadvertently left out of the DEIS.

2. Fellers, G. M., E. D. Pierson. 2002. Habitat use and foraging behavior of Townsend's big-eared bat (Corynorhinus townsedii) in coastal California. Journal of Mammalogy 83:167-177.

3. Pierson, E. D., and G. M. Fellers. 1998. Distribution and ecology of the big-eared bat, Corynorhinus (=Plecotus) townsendii in California. Report prepared for the Department of the Interior, U.S. Geological Survey, Biological Resources Division, Species at Risk Program."

Response: See response to Comments 1.8r and 1.8s on p. 33.

e. "Section 3.2.14, Pallid Bat and Townsend's Big-eared Bat, pages 3-57 through 3-58

1. The DEIS indicates that '[p]allid bats are very sensitive to disturbance at their maternity and hibernating roost sites. It is important that these sites remain undisturbed because these sites are essential for metabolic economy and juvenile growth (CDFG 1990).' The DEIS further states that 'Townsend's big-eared bats are extremely sensitive to disturbance at roost sites (Humphrey and Kuntz 1967) and may abandon a roost site following a single disturbance (CDFG 1990).' (page 3-57) However, the DEIS then goes on to say that '[t]hinning is expected to have long-term benefits for pallid and Townsend's big-eared bats by promoting the development of large-diameter trees which may provide suitable roosting sites.' The DEIS further contradicts itself by then stating '[p]ast management activities in the Project Area has likely impacted pallid and Townsend's big-eared bats by removing potential roost sites' and '[w]hile pre-commercial thinning will not remove habitat, this activity along with recreational activities have the potential to disturb roost sites.' (page 3-58) These statements seem to be contradictory regarding the effect of proposed

action on both the pallid bats and Townsend's bigeared bats. The Department recommends that this effect be further analyzed in the FEIS and be revised, as appropriate."

Response: See response to Comment 1.8t on p. 33.

6.6 BIRDS (CODE 605)

Respondents are concerned that red-breasted sapsuckers and neotropical birds were not adequately addressed.

a. "The MIS Assessment reveals the near total lack of data and necessary underlying information needed to reveal accurate MIS population trends... Indeed other than the acknowledgment that 'little is known' about Red-breasted sapsuckers, the reader can located no statements whatsoever about distribution, abundance or population trends of snag-associated MIS species. The same lack of information regarding population trends is present for the vast majority of MIS species in the planning area."

Response: See response to Comment 1.1f and 1.1g on p. 9.

b. "Neotropical Birds. Refugia for many species could be impaired by the widespread and ubiquitous use of the Slashbuster. The DEIS fails to adequately disclose or identify literature or scientific studies regarding impacts on Neotropical birds such that informed decision making can occur."

Response: Please refer to response to comment 3.2x on p. 77.

6.7 SALAMANDERS (CODE 606)

One respondent commented that data on the Siskiyou Mountain Salamander was inadequate to disclose impacts.

a. "Siskiyou Mt. Salamanders. The DEIS fails to disclose the anticipated impacts of mechanical slashbusting on Siskiyou Mountain Salamanders and their habitat."

Response: The effects to Siskiyou Mt. Salamanders are displayed in the FEIS in Section 3.2.19. Please refer comment 3.2c on p. 69.

7. RECREATION

Respondents commenting on recreation concerns requested clarification on several issues and pointed out perceived deficiencies in KNF analyses. Additionally, specific technical design elements were requested in the vicinity of the Pacific Crest Trail.

7.1 RECREATION (CODE 700)

One respondent requested that impacts on traffic, noise, and dust be more accurately characterized and felt that these concerns had been dismissed without proper disclosure and analysis.

a. "The curious contention that '[n]one of the action alternatives will result in measurable impacts to recreation activities' is immediately belied by the contradictory statement that '[t]he operational impacts of the project such as traffic, noise, and dust will be temporary.' (DEIS 3-167). It should be obvious that 'temporary impacts' are in fact 'impacts.'…permanent visual impacts are in fact planned for the project area. The construction of landings is an irreversible (but unanalyzed) impact on visual quality and recreational values.

   Given that the Report indicates that (1) the PCT is 'the most important recreational facility in the Area'; (2) that warning signs will be required; and (3) that the trail itself may be damaged by project activities; it is arbitrary and capricious for the agency to conclude that '[n]one of the action alternatives will result in measurable impacts to recreation activities'.

   Response: See response to comment 1.8z on p. 37. FEIS Recreation effects section has been revised to more accurately and completely summarize these effects for Alternatives 2, 4 and 5. The Preferred Alternative would not include project activities near the PACIFIC CREST TRAIL, thus these safety and trail damage concerns would be resolved.

7.2 VISUAL QUALITY/ENHANCEMENT (CODE 701)

Comments on visuals remarked on the lack of analysis of landings, temporary road construction, and the attainment of Visual Quality Objectives (VQOs). Disapproval of removal of hard boundaries through the cutting of large tree created by past logging was expressed.

a. "The DEIS (3-159) acknowledges the presence of Partial Retention and Distinctive Attractiveness Class A VQOs within the project area. Please note that in Partial Retention VQOs the agency must 'provide attractive, forested scenery where activities remain visually subordinate to the characteristic landscape.' (DEIS 3-159). Even more stringent is the KNF LRMP requirement that Class A lands be managed to 'maintain attractive, natural appearing forest scenery.' (Ibid).

   Hence we were very disappointed that the scant paragraph contained in the DEIS (3-167) in which impacts to visuals were "analyzed" made no mention whatsoever of the impacts of landings, 'temporary' road construction or yarding corridors on the attainment of VQOs.

We are extremely opposed to the Orwellian proposal on page 17 of the Scenery Analysis to 'eliminate the vertical notch on skyline' by [r]removing [the] tallest trees within the area to create a gradual tree height transition. Such actions are not appropriate in an LSR and CHU."

Response: This statement referring to Visual Quality Objectives accurately states that the LRMP's Partial Retention Visual Quality Objective applies to much of the project area. An even higher and more natural appearing level, the Retention Visual Quality Objective, applies to especially scenic upper elevation areas along the Siskiyou Crest where the Pacific Crest Trail and Siskiyou Crest Road are found. However, Class A is not a Visual Quality Objective–it is the highest of three levels of inherent scenic attractiveness, per national systems used by the USFS to measure scenery.

An expanded summary of the project Scenery Analysis is included in this FEIS, which identifies the achievement of Visual Quality Objectives. The Project Scenery analysis gave full consideration to the scenery effects of landings, road construction, yarding corridors and many other activities. The project established project scenery design standards to assure Visual Quality Objective achievement. To review how the project's Scenery Design Standards addressed landings, road construction and yarding corridors, refer to Mosier (2007a, 13).

This scenery restoration proposal within Alternatives 2, 4 and 5 would eliminate the unnatural appearing notch on the forest skyline that resulted from clearcut logging on adjacent private lands. This scenery impairment is viewed from the Siskiyou Crest Road, Pacific Crest Trail, and Interstate 5. Approximately 20 of the largest trees within a ridge top area of less than one acre would be removed to accomplish this restoration. The Preferred Alternative addresses this issue by excluding activities within several high elevation stands, including the one containing this scenery restoration opportunity.

7.3 TRAILS–PACIFIC CREST TRAIL (CODE 702)

Specific design elements around the Pacific Crest Trail were requested by one respondent:

a. "As the Forest Service's primary private partner for managing and maintaining the Pacific Crest National Scenic Trail (PCT), we at the PCTA have a couple of requests in regards to timber operations in close proximity to the Trail.

We greatly appreciate the mitigating measures identified in Appendix E of the DEIS. And, we have a couple of specific requests in regards to the Scenery Design Standards. We request that the Forest consider retaining 85% of the large trees within 100 feet of the PCT as opposed to the 50 feet identified in the second point. In addition, we ask the Forest consider flush cutting all stumps within 150 feet of the PCT as opposed to leaving 4" -6" stumps beyond 75 feet. Following timber operations, visible stumps can significantly detract from the experience of a trail user on the PCT. And, I saw no mention of the cut tree versus no-cut tree marking in Appendix E. We request that cut tree marking be utilized within 150 feet of the PCT to minimize the visual impact of paint on trees for the trail user."

Response: Large tree character is a key component of the desired scenery conditions within all sensitive views of the project, including the Pacific Crest Trail with its most critical immediate foreground views (for most of the project, 20" dbh is the maximum size tree that will be removed). While the Preferred Alternative does not propose activities within stands that include the Pacific Crest Trail, Alternatives 2, 4 and 5 do. Vegetation treatments in high elevation stands adjacent to the Pacific Crest Trail are proposed in Alternatives 2, 4 and 5 with the intention of improving forest canopy resilience and a legacy of long-term scenic attractiveness.

Within 50' of the Pacific Crest Trail evidence of logging can become noticeable even when careful techniques are used, and therefore fail to meet the Retention Visual Quality Objective; thus, 85% retention of large trees is necessary to limit trailside disturbances. Beyond 50' from the trail many changes can be done in a way that remains unnoticed due to screening of the forest canopy and landforms. Extension of the zone of 85% large tree retention would inappropriately limit opportunities to selectively thin as needed along the Siskiyou Crest to encourage portions of the canopy to grow into very large trees of 40"+ dbh. Thus, Alternatives 2, 4 and 5 have not been modified to extend the area of large tree retention as suggested.

Doubling the distance from the Pacific Crest Trail for flush cutting of stumps to 150' is considered to be excessively costly and would offer little if any benefit from trail views. This is because beyond 75', stumps of 4–6" height can be successfully concealed to meet the Retention Visual Quality Objective (unaltered appearance) through partial/complete stump burial with dirt, duff and woody debris.

Cut tree marking will be used in all units for all alternatives.

8. ROAD CONSTRUCTION

Comments both on road and landing construction are included in this section. This subject drew comments from people both opposed and others arguing for more roads in the project design. Many pointed out perceived problems with road building including: sedimentation, habitat fragmentation, excessive road densities, and lack of need for additional roads.

8.1 ROAD CONSTRUCTION (CODE 800)

Several respondents voiced complete opposition to new road construction, particularly in riparian reserves. Many also claimed that the roading was unnecessary while others indicated that more roads were needed for economic viability of the sale (see Section 9.1).

a. "I believe a better plan would focus on thinning the dense second-growth forest stands and completely avoiding new road construction and yarding through riparian reserves in the Mt Ashland Old-Growth Reserve."

Response: Indeed the proposed action is focused on primarily dense second-growth forest stands. The great majority of trees removed would be <20" DBH. Conditions describing when a tree larger than 20" DBH would be removed are described in Section 2.3.2 of the FEIS. No road construction is proposed in riparian reserves in the Preferred Alternative. The analysis of no road construction is covered within the range of alternatives when considering the No Action Alternative. For a discussion of yarding in riparian areas see response to comment 1.9o on p. 45.

b. "I support the basic thinning proposal of this project, but this must be achieved on the existing road system, or the negative impacts will outweigh the benefits. Moreover, the Forest Service should dedicate revenues from the project to the removal of existing roads from the already overburdened Beaver Creek Watershed after the project is completed."

c. "I urge the Klamath National Forest NOT to allow the building of additional roads associated with the logging activities...The building of 7 miles of road related with this project is unnecessary."

Response (to both a. and b. above): A no-roads building scenario was analyzed but was dismissed because of effects too similar to other alternatives.

8.2 TEMPORARY ROADS (CODE 801)

Despite the fact that many roads were designed as temporary, many respondents nonetheless had concerns about their short- and long-term impacts. Others advocated the use of temporary roads over the construction of helicopter landings.

a. [EPA] "Temporary spur road construction will increase road densities, result in the harassment of wildlife and, increase edge habitat and habitat fragmentation. Increased edge habitat results in decreased interior

forest exposing wildlife to increased sun and wind and potential vulnerability to external competition and predation. The project proposes to construct as many as 22 spur roads in the project area, two of which will cross streams and associated riparian vegetation. While the spur roads are temporary, and some areas will see some minor decreases in road density, road densities in the area are high. Post project road densities will still remain high (between 3.0 and 5.5 miles per square mile) and result in low habitat capability for deer, elk, marten and fishers. In addition, approximately 1.1 acres of late-successional forest and as much as 12 acres of mid-successional forest will be removed under the action alternatives due to the construction and use of the spur roads."

Response: Please refer to response 6.1a on p. 98.

b. [EPA] "While the EIS states that the construction and use of the temporary spur roads will have minor impacts on habitat, impacts under Alternative 2 are the greatest due to the number of road spurs that will be constructed under this action alternative. To minimize impacts from the construction and use of road spurs we recommend that the Forest Service select the alternative that will have the least amount of road spurs (Alternative 5 with 9 road spurs) and avoid construction of road spurs that cross streams and riparian areas…

Response: The KNF agrees that impacts from spur roads are more likely to occur under Alternative 2. The Preferred Alternative involves the construction of less mileage of road, and no construction within Riparian Reserves.

c. "Utilize ground based and cable harvesting wherever feasible. This means constructing temporary roads to assist with utilizing less expensive harvest systems. There has been considerable opposition to constructing temporary roads but they are needed in order to make the project even approach viability. We support the use of temporary roads that will assist with reducing costs associated with removal. The analysis of the temporary roads in the EIS exhibit very small increases in road density during the project while post project densities are actually less than pre-existing densities (Table 3-4)."

Response: Refer to response to comment 3.2c on p. 69.

d. "Consider allowing more temporary roads to be constructed to allow for more tractor and yarder logging. Temporary roads can be closed off and abandoned upon the completion of the harvesting if that is what is desired. When trying to minimize ground disturbance, it is often better to build, use, and abandon a temporary road, rather than construct a large 1 acre helicopter landing that will not be abandoned."

Response: Please refer to response to comment 3.2n. on p. 72.

e. "Another 7 miles of roads will severely fragment wildlife habitat, and ecologically 'take off the table,' for many plant species, a large area of land that is either obliterated by the road itself or degraded by the edge effects of the road, including alteration of drainage. The Klamath-Siskiyou region is in desperate need of relief from the impacts of roads, and the Klamath should focus on repairing and removing its existing road inventory, not tearing additional ones through the forest under its stewardship."

Response: Refer to response to comment 3.3c on p. 78.

f. "Please note that while temporary roads are often not counted toward road density figures, our organizations believe that road construction (temporary or not) often has long-term significant impacts to soil resources."

Response: Please refer to response to comment 3.7a on p. 82.

8.3 ROAD DENSITY (CODE 802)

Despite the fact that some roads will have only temporary impacts, respondents still asserted that their short-term existence results in increases in road densities and associated negative impacts. Others expressed approval of the temporary increase since long-term densities would be reduced.

a. [EPA] "Temporary spur road construction will increase road densities, result in the harassment of wildlife and, increase edge habitat and habitat fragmentation. Increased edge habitat results in decreased interior forest exposing wildlife to increased sun and wind and potential vulnerability to external competition and predation. The project proposes to construct as many as 22 spur roads in the project area, two of which will cross streams and associated riparian vegetation. While the spur roads are temporary, and some areas will see some minor decreases in road density, road densities in the area are high. Post project road densities will still remain high (between 3.0 and 5.5 miles per square mile) and result in low habitat capability for deer, elk, marten and fishers. In addition, approximately 1.1 acres of late-successional forest and as much as 12 acres of mid-successional forest will be removed under the action alternatives due to the construction and use of the spur roads."

Response: Please refer to response 6.1a on p. 98.

b. "Utilize ground based and cable harvesting wherever feasible. I support the use of constructing temporary roads to assist with utilizing less expensive harvest systems. There has been considerable opposition to constructing temporary roads but they are needed in order to make the project even approach viability. The analysis of the temporary roads in the EIS exhibit very small increases in road density during the project while post project densities are actually less than pre-existing densities (Table 3-4)."

Response: Refer to response to comment 3.2c on p. 69.

8.4 HABITAT FRAGMENTATION (CODE 803)

The effects of road construction on habitat fragmentation were expressed by respondents.

a. [EPA] "Temporary spur road construction will increase road densities, result in the harassment of wildlife and, increase edge habitat and habitat fragmentation. Increased edge habitat results in decreased interior forest exposing wildlife to increased sun and wind and potential vulnerability to external competition and predation. The project proposes to construct as many as 22 spur roads in the project area, two of which will cross streams and associated riparian vegetation. While the spur roads are temporary, and some areas will see some minor decreases in road density, road densities in the area are high. Post project road densities will still remain high (between 3.0 and 5.5 miles per square mile) and result in low habitat capability for deer, elk, marten and fishers. In addition, approximately 1.1 acres of late-successional forest and as much as 12 acres of mid-successional forest will be removed under the action alternatives due to the construction and use of the spur roads."

Response: Please refer to response 6.1a on p. 98.

8.5 SEDIMENTATION IN STREAMS (CODE 804)

This issue is closely related to disturbance in riparian areas (see Section). Commenters expressed concern about erosion and disturbance in the soils types within the project area and potential impacts to downstream waterways.

a. "Of particular concern is the highly unstable and erosive nature of the granitic and schist soils found in Beaver Creek. The Klamath was once the third-largest producer of salmon on the West Coast, and today supports only a fraction of that amount...Though the Klamath River and the environment surrounding it has suffered negative impacts related to logging, mining, and farming in the past, it is one of the last wild, beautiful, unspoiled areas in the U.S. and still supports the dwindling salmon populations."

Response: The Fisheries Report and Fish Biological Assessment address potential impacts to fish species at length. Analysis is conducted at the site, 7th field watershed, and 5th field watershed scales, and considers short and long-term effects. The Fisheries Report concluded that there would be no adverse effects and a low level of indirect effects to coho salmon, no loss of viability to steelhead trout and Chinook salmon, and no adverse affects to resident rainbow trout (B. Thomas 2007a, 41).

b. "I would also urge great care in logging and yarding trees through fragile streamside areas. This project, when considered with the past cumulative effects of logging and road-building activities in the area - sedimentation, fragmentation, and disturbance of wildlife habitat among other things - would continue to erode the health of not only Beaver Creek, but also, the Klamath River."

Response: Cumulative watershed effects of logging and road-building have been considered and are included in the analysis presented in Section 3 of the EIS.

c. "Beaver Creek is an important tributary to the Klamath River and it already has far too many logging roads. These roads bleed sediment into nearby streams and fragment wildlife habitat. The Beaver Creek Watershed is very prone to erosion. The Forest Service should reconsider any plans to build new roads in the watershed. Building 7 miles of road as a part of this project is unnecessary as the Forest Service has identified other means to accomplish fuels reduction and thinning without building these logging roads."

Response: Cumulative watershed effects of logging and road-building have been considered and are included in the analysis presented in Section 3 of the EIS.

8.6 CONSTRUCTION OF LANDINGS (CODE 806)

Respondents were concerned about a lack of detail in the analysis of helicopter landings in regards to cost, size, distance from harvest units, and area of disturbance. Some requested consideration of more roads as an alternative to more helicopter landings due to environmental effects.

a. "I'm not sure if the Forest evaluated the need for helicopter service landings. This would lead to an increase in land impacts than what is assessed in the current document. I'm not sure if the DEIS has adequately

evaluated the increased environmental impacts and economic costs associated with large helicopter landing construction to accommodate the helicopter operations as well as associated service landings. The construction of adequate helicopter landings and service areas, no more than 1/4 mile from harvest units, will have significant ground disturbance and tree removal in order to meet OSHA requirements. I think these impacts and costs would be greater and longer term than any impacts and costs associated with temporary road construction and decommissioning."

b. "Wherever helicopter harvesting is proposed it is essential that helicopter landings be within ¼ mile from harvest units in order to reduce significant flight costs. The number of proposed helicopter landings did not increase from Alternative #2 to #5 even though Alternative #5 has a significant increase in helicopter acres. This would lead me to think much of the increased acreage would have flight distances greater that ¼ mile. I'm not sure if the Forest evaluated the need for helicopter service landings. This would lead to an increase in land impacts than what is assessed in the current document."

Response (to a. and b. above): See response to comment 2.1c on p. 52.

c. "The DEIS states landing size for the ground based equipment will be approximately .5 acre. The proposal also calls for all units <45% slope to be whole tree yarded. Anyone who has been involved with whole tree yarding knows that .5 acre is not sufficient to handle all of the merchantable material and slash. These landings will have to be significantly larger in order to handle all the material and should be stated up front in the analysis."

Response: Proposed new landing size is estimated based on past experience with tractor yarding and the expertise of professional foresters on the Forest. Landing size is approximate and will be adjusted based on safety needs of the operation. Final landing location and size will be determined by the Sale Administrator and the Purchaser (refer to response to comment 2.1c on p. 52. The total acres affected by landing construction will not exceed acreage figures identified in Chapter 2 of the FEIS. In addition to new landings, 35 existing landings have been identified for use, several of which are more than .5 acre. Two large biomass landings (approximately 2 acres) have been identified on roads 41S10 and 40S06.

d. "Consider allowing more temporary roads to be constructed to allow for more tractor and yarder logging. Temporary roads can be closed off and abandoned upon the completion of the harvesting if that is what is desired. When trying to minimize ground disturbance, it is often better to build, use, and abandon a temporary road, rather than construct a large 1 acre helicopter landing that will not be abandoned."

Response: Please refer to response to comment 3.2n. on p. 72.

9. SOCIAL/ECONOMICS

Social and economics comments included concerns about the economic viability of the treatments given the constraints on road construction and the use of helicopter logging. Others expressed concern that the treatment was being developed not for economic viability but because of industry economic preferences. Others expressed greater local economic benefit through the specification of hand piling to create jobs. Level of thinning was also cited as a sale viability factor.

9.1 ECONOMIC IMPACTS AND/OR VIABILITY (CODE 902)

a. "The biggest concern from AFRCs perspective is the economic viability of this project. Even though it is minutely displayed in the document, the viability of being able to implement the project should be a major concern for the Forest. You are proposing to harvest small diameter material, low volumes per acre, and lesser value species by utilizing very expensive harvest systems. All three treatment alternatives contain a significant amount of helicopter logging. A considerable amount of funding has been spent preparing the NEPA documentation for this project. It would be shameful from a taxpayer's perspective to not implement the project due to the selection of an alternative that is not economically feasible...Minimize the use of helicopter harvesting. With current log values, stump to truck costs do not pay for the value of the timber being removed. This does not even account for the haul cost."

Response: See response to comment 2.1c on p. 52.

b. "Utilize ground based and cable harvesting wherever feasible. I support the use of constructing temporary roads to assist with utilizing less expensive harvest systems. There has been considerable opposition to constructing temporary roads but they are needed in order to make the project even approach viability. The analysis of the temporary roads in the EIS exhibit very small increases in road density during the project while post project densities are actually less than pre existing densities (Table 3-4)."

Response: See response to comment 2.1c on p. 52 and 3.2c on p. 69.

c. "We strongly urge the agency to provide local employment via hand pile and burning treatments instead of mechanical mastication, particularly on steep slopes and within riparian reserves in this impaired watershed."

Response: This is a valid opinion which will be considered in the decision making process; however, there is an economy of implementation which must also be considered as well. All of the action alternatives provide opportunities for local employment through contracts for timber harvest, hand-piling, underburning or use of masticators. The Preferred Alternative includes 981 acres of hand-piling and 3,747 acres of underburning which would provide jobs for several years. Between DEIS and FEIS, the use of masticators has been limited to slopes ≤35% and use of masticators has been reduced in the Preferred Alternative when compared to Alternatives 2 and 5.

d. "Based on discussions with the LSR working group, the intent of treatments within LSR's was to achieve management with as few treatment entries as possible with one treatment being preferable...For the long term it appears more trees will be on the site than desired. This will eventually lead to increased

competition, stress, and fuel hazard. I ask why not thin a little heavier this entry in order to insure meeting your long term desired condition without having to deal with these issues in the future. This could also add more value to assist with economic viability for the project."

Response: Please refer to response to comment 3.1h on p. 65.

e. "The agency refused to develop or consider a no tractor yarding alternative because 'Historically, timber sales on the Forest that are helicopter/cable only have not sold due to high costs and low or nonexistent profit margins.' (DEIS 2-29). Similarly, the Forest Service refused to consider implementing Alternative 3 (No Temporary Spur Road Construction) because it 'would require funding so much in excess of the other action alternatives that it may not have been possible to implement.' While our organizations are committed to working with the agency to develop a project that is economically feasible, it is imperative that the Forest Service realize that it may not arbitrarily restrict the reasonable range of action alternatives regarding yarding and hauling mechanisms in a LSR that is impaired watershed simply due to the economic preferences of the timber industry. Indeed, decisions based entirely on profit margins violate NFMA's requirement that a given logging system cannot be chosen because of dollar value alone. There is no other justification for using the ground-based logging systems and new road construction in the impaired LSR given in the record besides economic considerations; while many reasons are identified illustrating why using such systems is not appropriate for this LSR."

Response: Please refer to response to comment 2.6b. on p. 59.

f. "Minimize the use of helicopter harvesting. Helicopter logging costs and fuel rates cannot justify their use except in cases where there are high values in the timber being removed. This is not the case in the Mount Ashland project."

Response: Refer to Response 9.1b on p. 114. Helicopter yarding was minimized in both the Preferred Alternative and in Alternative 4.

g. "I'm not sure if the DEIS has adequately evaluated the increased environmental impacts and economic costs associated with large helicopter landing construction to accommodate the helicopter operations as well as associated service landings. The construction of adequate helicopter landings and service areas, no more than ¼ mile from harvest units, will have significant ground disturbance and tree removal in order to meet OSHA requirements. I think these impacts and costs would be greater and longer term than any impacts and costs associated with temporary road construction and decommissioning."

Response: Please refer to response to comment 2.1c. on p. 52. The impacts of landing construction are analyzed in Chapter 3 of the FEIS by resource.

10. EXPLANATION OF CODES

CONTENT ANALYSIS CODE LIST AND DEMOGRAPHIC CODES

ORGANIZATION TYPE

A	Attorneys (legal)
I	Individual Citizen
T	Tribal Government
F	Federal
S	State
C	County
P	Professional Scientific Organization
N	Industry Interest (Ranching; Timber, etc.)
E	Environmental interest
R	Recreation Interest
L	Congressional/Legislative
B	Business

RESPONSE TYPE

1	Letter or postcard
2	E-mail
3	Fax
4	Form Letter – Klamath Siskiyou Wildlands Center

OVERALL PROJECT SUPPORT

A	AGREE with proposal overall
D	DISAGREE with proposal in some way
U	UNKNOWN

RED FLAG

1	Technical Response
2	Requesting specific information

100 - PROCESS (General comments on DEIS; data; monitoring; BMPs)
101 - Public Involvement
102 - Consultation/Coordination
103 - Purpose and Need
104 - Compliance with NEPA Process
105 - Conformance/conflicts with Forest Planning documents (NW Forest Plan)
106 - HFRA Planning Process (Healthy Forest Restoration Act)
107 - New data/reports; corrections; or additional information/analysis needed
108 - Cumulative Effects Analysis needed

200 - ALTERNATIVES (Alternative development process)
201 - Alternative 1 – No Action
202 - Alternative 2 – Proposed Action
203 - Alternative 4
204 - Alternative 5
205 - Alternatives considered but eliminated
206 - Additional alternatives suggested
207 - Combinations
208 - Monitoring

300 - EFFECTS OF PROPOSAL – VEGETATIVE TREATMENTS
301 - Harvest systems (slashbuster masticator; mechanized harvesters; skid trails)
302 - Biophysical concerns (old growth)(late successional reserve)
303 - Habitat restoration treatments
304 - Snags and late successional habitat
305 - Understory flora
306 - Soils
307 - Noxious weeds
308 - Mistletoe

400 - FIRE AND FUELS
401 - Treatment of activity fuels (fuels through vegetative treatments)
402 - Fuel treatments – DFPZs (defensible fuel profile zone)
403 - Fire behavior (fuel breaks; fire severity; density management; fire hazard)

500 - AQUATIC RESOURCES (Aquatic Conservation Strategy)

501 - Watershed (hydrology; water quality)
502 - Source water (drinking water)
503 - Riparian areas

600- WILDLIFE AND FISHERIES RESOURCES

601 - Management Indicator Species
602 - Fish habitat (salmon)
603 - Spotted owl
604 - Mammals
605 - Birds
606 - Salamanders
607 - Bats

700 – RECREATION

701 - Visual quality/ enhancement
702 - Trails (Pacific Crest Trail)
703 - Access to public lands

800 – ROAD CONSTRUCTION

801 - Temporary roads
802 - Road density
803 - Habitat fragmentation
804 - Sedimentation in streams
805 - Equipment
806 - Construction of landings

900 - SOCIAL/ECONOMICS

901 - Social impacts
902 - Economic impacts and/or viability